# The Chemical Age

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## Some Legal Matters

THERE are few questions more difficult to the individual than those involved in agreements between employers and employed, and Mr. J. W. Williamson, writing in the "Journal of Scientific Instruments" has given a valuable survey of the general law relating to contracts that should be of interest to professional men. In the sphere of industrial employment there arise numerous conditions and circumstances that introduce complications and that call for a scrutiny of these agreements more thorough than those drawn up for academic appointments. A matter of considerable difficulty is that of secrecy in regard to an employer's business. Mr. Williamson rightly remarks that the necessity of maintaining secrecy concerning plant, processes and business of a confidential nature is an obligation laid by common law upon all servants. It is usual to recite these obligations in the written agreement as a reminder to the parties that these obligations exist, but one cannot help feeling that to do so weakens the position. It is not always realised by those who have no legal agreement for employment that similar obligations lie upon them also. No self-respecting employee; no one who has the least sense of his personal honour and responsibilities, would wittingly divulge his employer's confidential business, but "evil is wrought by want of thought . . ." as the old tag has it.

What is the position of a servant who has all the confidential secrets of his employer securely locked away in his memory but who leaves his employment for that of a business rival? The legal position may be clear, but what is likely to be the actual course of events? At first, no doubt, there is careful reticence; but so soon as the new surroundings become more familiar than the old, and personality is merged in environment, confidential knowledge becomes "experience" and secrets are secrets no longer. It is no doubt with a view to prevention of leakage for this reason, no less than to guard against competition by opening new concerns, that many employers insert a "restraint of trade" clause in their agreements for service forbidding the employee to set up in business in opposition to the employer within a defined area and for a defined time after the expiration of the contract; we have seen agreements which prevented the employee from taking service with a firm manufacturing similar products, and we believe that this type of clause is, or was, quite common.

Another difficulty is in respect of patents. It is commonly covenanted that in the event of any patentable invention being made by the employee during his term of service, it shall be communicated to his employer and shall become the employer's sole and absolute property. This is a clause which ought to depend upon the work done by the employee. It is argued by employers that unless the employee had been given access to the works and allowed to join in the industrial life of the organisation he could not have made the invention; therefore any benefits should accrue to the firm. On the other hand, it is equally likely that the employee, having made such an invention, will keep it to himself—if he knows the law—until a sufficient interval of time shall have elapsed since leaving his employment, and then patent it for himself, so that the firm will lose the benefit of it and also the services of a perhaps valued employee. We have seen many patents, some quite simple, though exceedingly valuable, not the result of laborious researches, lost to the individual by the operation of this clause and the result has been a permanent feeling of disappointment.

Wisdom would suggest recognition that the individual can be more successful in the development of his patent if he works with his fellows, and, on the other side of the fence, that the labourer is worthy of his reward. In obtaining the reward of a patent there are two stages. One is to find a patentable invention; the other is to exploit that invention. It is too often believed that invention is the more difficult of the two stages; often that belief is highly fallacious. When the employee is engaged specifically as a research chemist the argument is very different. Here it is usually held that the employer has to finance the work of the chemist to the tune of not less that £1,000 a year for each research chemist employed, and that he is therefore entitled to complete and sole use of any discoveries, inventions or patents that may accrue from this work.

It is not every patent that can be sold as a patented article; not infrequently the patent is applied to a small part of a whole machine or process, and by its application makes the whole workable where it was not workable before, or makes the whole more easily saleable than before. That is one of the greatest difficulties in assessing the returns from a patent. It must be confessed that the method of paying a research staff a fixed salary and allowing nothing for improvements accruing from the work is not highly conducive to the stimulation of enthusiasm. We have often wondered whether a little more of the spirit of adventure might not be inculcated among the staffs of firms, and particularly among the technical and sales staffs by the payment of less annual salary supplemented with a bonus, not only upon profits, but upon a turn-over-cum-profits basis.

# Notes and Comments

## Formation of Gums in Gases

FEW problems are more difficult than to remove completely small quantities of solids suspended in gases; the cleaning of blast furnace gas is an instance known to everyone. The difficulty is immensely enhanced when the quantities of solid present are exceedingly minute and must be completely removed; not even electrostatic precipitation is adequate to deal with problems of this character. Some new information upon this subject was recently published by Mr. H. Hollings, chief chemist to the Gas Light and Coke Company, in a paper to the Midland Junior Gas Association. Gum formation in coal gas seems to originate from the action of nitric oxide upon unsaturated hydrocarbons. It was generally supposed that this nitric oxide was due to oxygen drawn into the retort from the waste gas from the combustion chamber. Recent experiments, however, indicate that when the nitric oxide in the crude gas exceeds about 3 parts per million it is probably formed by the combustion of 1 or 2 per cent. of air just inside lid of the retort. When a small flame of air burns in an atmosphere of crude gas under such conditions that the products of combustion are rapidly chilled, which may well be through the radiation of heat from the iron-work, concentrations of nitric oxide up to 10 and even 20 parts per million may be produced. It would appear from these experiments that by keeping an adequate pressure in the retort the formation of nitric oxide can be prevented, but this is not invariably so. The nitric oxide and the unsaturated hydrocarbons form gum which is later deposited on the meters and gas appliances.

Some works only have this trouble; in others it is absent. It is the practice now to dry town's gas usually by calcium chloride solution to prevent corrosion of the mains. When the dying plant is placed at the inlet to the holder gum trouble is experienced, but in general where the gas is dried after passing through the holder gum trouble is absent. At one works of the Gas Light and Coke Company, where the drying plant was moved from the inlet to the outlet of the gasholder, the amount of gum contained in the gas was reduced by no less than 94 per cent. Gas as stored in the holder before drying carries sufficient water to condense on the gum particles and precipitate them. The moral is that when a very minute solid impurity is to be removed from a gas holder of sufficient size to allow time for precipitation and settlement must be installed and the gas must be stored therein in a slightly supersaturated condition as regards moisture. Natural processes will do the rest, as the supersaturated vapours will condense on the solid nuclei.

## An Example

IT is said that a handful of good life is worth a bushful of learning. To these "good lives" belongs that of Dr. A. E. Macintyre, the eminent Canadian industrial chemist whose death the profession now deplores. Without proper chemical training as we know it to-day, he built and managed a wood distillation plant before he was 20 years of age. When it was destroyed by fire after six years he came to Scotland to acquire academic training. He was a broad-minded man of the world and was by turns a consulting chemist, a politician, a professor of chemistry in an institution associated with McGill University. Then he came back to Europe to study again—to take his Ph.D.! Returning to Canada he re-entered politics and for three years was assistant editor to an important Canadian national paper. That would be adequate to gain him a warm place in our editorial hearts! Not content with this varied life, however, Dr. Macintyre then became chief chemist to the Quebec Arsenal, where his work included metallurgy, the chemistry of explosives and other problems. He finally became superintendent in charge of a new arsenal, the installation of which he had supervised. Finally he ended his official career as chief chemist to the explosives division of the Canadian Department of Mines. That so varied a career should be possible, and that it should be successful is surely an encouragement and a lesson to those chemists who seem to-day to be inextricably enmeshed in the dullness of specialisation.

## Commercial Morality

IN days not so long ago the business man thought himself clever if he could "best" those with whom he dealt. The law upheld him. With the exception of certain classes of agreements, such as between a solicitor and his clients and between companies and directors, there is no legal necessity to disclose all relevant facts. Since the understood object of business was to make gain, the law did not deem it to be fraudulent if either party concealed material facts. No doubt this was based upon the gound that it is not necessary for a party to give the other information as to the amount of gain he expected to make, nor how his estimate of gain was built up. It does not amount to misrepresentation, for example, if unsound goods are marketed even though the seller is aware of the defects. Although the law may have condoned such methods in the past, business morality has in well-managed concerns advanced far beyond the somewhat primitive examples just given. The practice to-day is for both parties to give a fair deal which shall encourage future business and cement friendly business relations. Legal practice appears to be coming into line with modern commercial morality and the Courts are beginning to expect both parties to put their cards fairly on the table when making bargains. Cases could be cited in support of this view, the latest being that of *With* v *O'Flannaghan*, in which a business was sold without it having been disclosed that it had been going down-hill owing to the illness of the owner. The Court of Appeal held that this invalidated the contract to purchase, and it would seeem that whenever a contract has been made on the basis of reliance upon the vendor, failure to disclose all material facts can cause the contract to be set aside.

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PHOSPHATE rock imports into Denmark declined from 205,891 metric tons in 1934 to 199,205 tons in 1935. Receipts from Morocco, the leading source, declined 9,000 to 143,296 tons, while those from United States rose 6,000 to 43,115 tons.

# The Industrial Applications of Sorbitol

By LOUIS LIGHT, Ph.D. (Zurich), A.I.C.

Louis Light, Ph.D.(Zurich), A.I.C.

SORBITOL, now made in the United Statess on an extensive scale from corn dextrose, is a hexahydric alcohol isomeric with mannitol, talitol, iditol and dulcitol. It is found in nature in the berries of the mountain ash, in pears, apples, cherries and many other plant products. Compared with glycerine, sorbitol has twice the molecular weight, twice the number of carbon atoms, and twice the number of hydroxyl groups.

In the pure form, sorbitol is a white, crystalline powder melting at 93-95°C., but the commercial product is a thick, viscous syrup, pale straw in colour, containing 85 per cent. sorbitol on the average, the balance comprising sodium sulphate (about 1.25 per cent.), glucose (about 0.75 per cent.) and water. Its specific gravity, viscosity and refractive index are all considerably higher than those of glycerine, and chief interest at the present time is centred on its use as a substitute for glycerine in the paper and other industries where it offers advantages over glycerine, as will be gathered from the data given below:—

| | |
|---|---|
| Specific Gravity .. .. | 15% water. 1.350. |
| Viscosity at 25° C. .. | 7,400 centipoises. |
| Refractive Index at 25° C. | 1.4838. |
| Solubility in alcohol .. | Readily soluble in 95% alcohol. |

Sorbitol is completely soluble in water. The higher specific gravity and greater viscosity make it valuable as a blending agent. Under conditions of high humidity, sorbitol picks up much less moisture than does glycerine and it should be noted that the amount of water held by glycerine-sorbitol mixtures decreases progressively as the concentration of sorbital increases.

## Paper Manufacture

Sorbital-softened paper holds less moisture than glycerine-softened paper. This difference in moisture pick-up is particularly noticeable at the upper end of the humidity range. Sorbitol-softened papers also transmit from one-third to two-thirds less moisture than do glycerine-softened papers. Thus the moisture pick-up and moisture vapour transmission are definitely much less in the case of sorbitol-treated papers. The sheets are more flexible and softer than untreated paper in both cases.

In recent American experiments to study the influence of glycerine and sorbitol upon "glassine" paper it was established that sorbitol is more easily absorbed by "glassine" paper and is more firmly held than glycerine. All samples were very soft and pliable at the beginning of the experiment, but at the end (after exposure to a warm current of air for several days), the glycerine-softened paper had dried and hardened to a condition approximating to a completely unsoftened paper, while the sorbitol-softened paper was only very slightly less flexible than the freshly prepared samples. This is an indication of the superiority in retention of the softener when sorbitol is used for softening.

## Printing Rollers

The shrinking and hardening of glue gels (on which printing rollers are based) is caused by loss of moisture, and the presence of a hygroscopic substance, such as glycerine, or sorbitol, counteracts that loss. Glycerine is now used almost exclusively as the hygroscopic ingredient, but advantage will now be probably taken of the discovery that mixtures of sorbitol and glycerine are more satisfactory for softening printing rollers than either component alone.

Rollers containing sorbitol are less sensitive to atmospheric changes than those containing glycerine, and possess greater firmness and permanence than corresponding glycerine-glue mixtures. This has been found to hold in more complex mixtures as well, and among the conclusions drawn are the following:

The hygroscopic behaviour at high relative humidities of the glue-glycerine print rolls is improved as sorbitol is substituted for glycerine. Properly made sorbitol printing rollers have consistently shown a life of approximately three times that of the ordinary glue-glycerine rollers. The sorbitol gives the mixture firmness and resistance to moisture at elevated temperatures and high humidities, while the glycerine prevents the development of an objectionable surface hardness at low humidities.

## Leather Manufacture

Compared with glycerine in the soft leather industry, the use of sorbitol has shown large savings. Roughly, it has been found that 40 per cent. of sorbitol by weight will produce the same softness as 100 per cent. of glycerine by weight. When desired, greater softness can be obtained by the use of sorbitol than by glycerine without obtaining a sticky surface on the skin. Leather softened by sorbitol does not exhibit as great a variation under changing conditions of humidity.

The usual hygroscopic properties of sorbitol syrup indicate its value to many other industries, such as textiles, tobacco, etc. Its advantage over other widely used humectants lies in the fact that it retains moisture well at low humidities, while at high humidities its moisture pick-up is not excessive. It therefore exerts a levelling influence on the moisture contents of substances impregnated with it. Sorbitol ethers, prepared by heating sorbitol with an alkyl or aryl halide and a base (U.S. Pat. 1,936,093 of E. I. Du Pont de Nemours and Co.), have been proposed as plasticisers in cellulose lacquers. Useful resins and plasticisers of the "glyptal" type are clearly also obtainable by condensation of sorbitol with dibasic organic acids or their anhydrides.

With a pleasant flavour and sweetening power approximately equal to half that of sugar, sorbitol syrup has interesting possibilities in the preparation of chocolates and honey-like foodstuffs although the current price militates aganst any extensive use in these directions. Of more immediate interest is the fact that it can be safely taken by diabetics as a substitute for sucrose.

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STATISTICS on Italian industrial employment, prepared by the Confederation of Industry, placed the average number of operatives employed in the chemical industry in August, 1935, at 50,611 and the total number of operating hours 8,740,000, as compared with 42,900 operatives and 8,160,000 operating hours in August, 1934, an increase of 16 per cent. in the number of workers and of 7 per cent. in total hours.

# The Fuel Research Station, East Greenwich

## Third Annual Visiting Day

THE Fuel Research Station at East Greenwich was visited on Tuesday by over 300 guests, who were received by the chairman of the Fuel Research Board (Sir Harold Hartley, F.R.S.), and the Director of Fuel Research (Dr. F. S. Sinatt). They inspected the station and saw some of the investigations in progress.

The Fuel Research Station is the principal fuel establishment of the Department of Scientific and Industrial Research, and is the headquarters of the Fuel Research Coal Survey. Fully equipped laboratories have been established in nine large coalfields of the country, and in these laboratories the seams are examined as completely as possible. It is the purpose of the Fuel Research Coal Survey to ascertain the properties of each coal seam in Great Britain, and the industrial purpose for which it is most suited. When the examination has been completed in the laboratory, further experiments on a large scale are frequently necessary, and these are carried out at the Fuel Research Station. In a year some 8,000 tons of coal are treated in the various processes at the station, and the amount of gas made is greater than in many gasworks in the country.

### Plant Units of Commercial Size

The Fuel Research Station is equipped with units of various types of plant of a commercial size. By constantly comparing the results obtained at the Fuel Research Station with those obtained in the Coal Survey Laboratories, it is becoming possible to foretell the behaviour of coals in large scale plants. In consequence, it is possible to confine the large scale experiments to coals upon which little information is available. Among the units at the station are carbonisation plants similar to those in operation in gasworks. Special arrangements have been installed to collect and measure all the products so that the large scale experiments can be carried out with an accuracy not less than that possible in the laboratory. The low-temperature carbonisation plant devised at the station continues to work in a satisfactory manner, and one of the narrow brick retorts has now been in continuous operation night and day for four years. A commercial unit of this pant, capable of producing between 30-50 tons of low-temperature coke a day has been erected in the Midlands.

Some concern is felt for the rapid way in which the high-class coking coal of the country is being depleted, and the object of the blending experiments at the station is to extend the range of coal which can be used to produce metallurgical coke.

### Conversion of Tar into Motor Spirit

The plant for the conversion of low-temperature tar into motor spirit was in operation. The process of hydrogenation demands the use of pressures of about 3,000 lb. per sq. in., and temperatures of about 800° F. The plant is capable of treating 300 gallons of tar a day, that is, the amount of tar that could be produced from plant for the low temperature carbonisation of coal which is in operation at the station (treating 16-20 tons of coal a day). By hydrogenation, low-temperature tar of the distillates from high-temperature tar can be converted into an equal volume of first-class motor spirit. The plant has worked successfully in a number of trials, and the spirit produced has been tested in industrial motors. The question of the hydrogenation of low-temperature tar has now been largely solved, and attention is being directed to the more difficult problem of the hydrogenation of high-temperature tar.

The preparation of lubricating oil from coal is a most important problem, and attention is being concentrated upon it from a number of standpoints. A small plant has been erected for the conversion of water-gas into motor spirit which can, by further treatment, be converted into lubricating oils.

The burning of coal in the pulverised form is proving of increasing interest to many branches of industry, and the " grid " burner which has been devised at the Fuel Research Station is now in operation in a number of industrial plants. Experiments have been completed in which the amount of steam raised in the Lancashire boiler at the Fuel Research Station has been increased by 100 per cent. and trials are proceeding to increase the output still further. This means that the Lancashire boiler becomes much more flexible as a commercial plant.

Work on the cleaning and sizing of coal has been directed to the important question of coal breakage, and the effect of this breakage upon the properties of the coal. The plant for cleaning coal by dry methods, which has been devised by an officer of the organisation, continues to give excellent results, and its development is proceeding along satisfactory lines.

### Pulverised Fuel

Experimental work upon powdered fuel at the Fuel Research Station has been devoted mainly to the problem of burning this type of fuel in small water-cooled furnaces such as are found in Lancashire and Scotch Marine boilers.

In the course of this work a number of new types of burner have been devised and have reached varying stages of development. Of them, one, the " Grid " burner, has been in commercial use for some time, and has been found to be particularly suitable for Lancashire boilers and for rotary melting furnaces. A second, the " multijet " burner, which is a modification of the " grid " burner, although already in commercial use, is not so far advanced. It is, however, expected, as a result of tests made in the Babcock boiler and the Lancashire boiler at the station that this burner will ultimately be the more successful. Incidentally, highly satisfactory results have been obtained with it as a gas burner for heating experimental retort settings.

The objects kept in mind in developing these burners are: (a) to extend the range of fuels which can be dealt with in powdered form (*e.g.*, anthracite has been burned in the Babcock boiler and Welsh steam coal with 15 per cent. of volatile matter in the Lancashire boiler); (b) to extend the range of loads from a given burner (*e.g.*, a burner rated at 700 lb. of coal per hour has burned from 160 lb. to 1,000 lb. per hour and one rated at 350 lb. per hour from 120 lb. to 1,000 lb. per hour); (c) to increase the efficiency of combustion (78 per cent. efficiency has been obtained from a Lancashire boiler with a superheater but no economiser or air preheater); (d) increase the steam output of a given boiler (*e.g.*, commercial users claim to generate more than 20,000 lb. of steam per hour from a 30 ft. by 9 ft. boiler, and over 14,000 lb. of steam per hour have been raised from the 28 ft. by 7 ft. 6 in. Lancashire boiler, rated at 5,000 lb. per hour, at the station); (e) the examination of the influence of furnace conditions and types of coal upon combustion (as an example, tests have been made with a series of blends of high and low volatile coals for comparison with coals of corresponding volatile contents).

### Boiler Firing with Air-borne Fuel

When powdered fuel is applied commercially to Lancashire boilers a single stream of air-borne fuel is frequently divided to supply two or more burners, *e.g.*, when a single-unit mill is used. In such cases it has been found difficult so to divide the stream that each furnace gets its correct quantity of both air and fuel and also to ensure each furnace getting similar proportions of fine and coarse particles. As a result not only has efficient operation been impossible, but extreme cases have

actually arisen where it has not been possible to keep both burners alight at the same time.

To overcome this difficulty a distributing device has been designed at the station, which, however heterogeneous the stream of fuel and air entering it, divides that stream into two equal and similar parts. The device is in constant use at the station, and has also been successfully applied to several commercial installations.

## Coal Purification

The washery at the Fuel Research Station has been laid out with three main objects in view. First, research work in connection with the preparation of coal generally, including the development of new processes and technique; secondly, the preparation of special grades and qualities of fuel for other experiments at the station; thirdly, co-operation in the survey of national coal resources. With these objects in mind full scale plant has been installed wherever possible, and if an intermediate scale has had to be adopted then a capacity of about 2 tons per hour has been made the minimum.

Special attention is being given to coal breaking. The coal industry is beginning to experience certain difficulties owing to the diminished demand for large coal and the increased demand for graded sizes. Tests carried out under the directions of survey officers are proceeding in certain coalfields with a view to providing data regarding the breaking properties of seams and the relative value of various types of breakers. The Fuel Research Station is co-operating particularly in assessing the stability of breaker products when subjected to transport and handling.

A detailed study is being made of the effects of moisture in fine coal as mined, and on treatment such as dedusting, screening and dry cleaning. The use of flocculating agents for promoting rapid settlement of suspended solids in washery circulating systems is now an accepted practice, but work is proceeding at the station to try and elucidate the actual mechanics of the processes involved and to determine the best way of applying these flocculating agents.

The hydrogenation of coal is the process which permits a higher yield of oil to be obtained from coal than any other process. Although at present aimed principally at the production of motor spirit, it is possible that future developments will lead to oils suitable for other uses. Researches at the Fuel Research Station have not been confined solely to the production of motor spirit from coal, but have also been directed towards the examination of the reactions which occur between coal and hydrogen under different conditions.

These investigations have included (1) a study of the earliest stages of reaction between coal and hydrogen leading to a discovery of a means of improving the coking power of coals; (2) a general study of later stages of reaction leading to the permanent liquefaction of coal under varying experimental conditions, and in the presence and absence of a catalyst; (3) the investigation of the relation of the composition of coal, particularly with regard to possible catalytic effect of its inorganic constituents and ease of hydrogenation: (4) examination of the products of hydrogenation with a view to finding industrial uses other than their use as a liquid fuel.

A continuously operated plant capable of treating 28 lb. of coal per hour is being used for the study of the effect of experimental conditions and of the behaviour of typical coals.

## Hydrogenation-Cracking of Tar

The low-temperature carbonisation of coal produces large amounts of tar for which new industrial outlets are continually being sought. Similarly the whole of the high-temperature tar produced in this country does not always find a ready market. Processes such as hydrogenation-cracking which employ tars and tar distillates as raw materials for the production of fuel oils are therefore worthy of examination.

Experimental work has been in progress to determine the conditions and plant necessary for the conversion of tars and tar oils into materials, such as motor spirit, for which the market is relatively large. The process is one of hydrogenation-cracking and is operated under high pressures of hydrogen (normally about 200 atmospheres) and at elevated temperatures (350-550° C.). The most satisfactory conditions and catalysts are being determined by experiment, and continuously operated plants are in use in which the variables of the process are being studied. The catalyst favoured at present for the treatment of crude low-temperature tars is a sulphide of molybdenum supported on a porous gel, but for selected oil distillates more active catalysts are available.

It has been found that low-temperature tar with no pretreatment other than filtration to remove dust can be hydrogenated satisfactorily. In one passage through the supported molybdenum catalyst there is obtained a produce which is free from pitch and which contains motor spirit amounting to 45 per cent. of the tar treated. By reprocessing the high-boiling oils the total yields of spirit becomes 76 per cent. by weight of the tar and 100 per cent. by volume. Tar fractions can be treated with greater ease than crude tar. Creosote, for example, is much more readily treated than high-temperature tar. The crude spirit requires very little refining to make it a stable water-clear motor spirit having satisfactory properties. It has a good anti-knock value (octane number 70-75).

The scale of operation of the process has been increased in stages, the latest development being the design and construction of a plant capable of dealing with 1-2 tons of raw material per day. In erecting this plant, two main tasks were undertaken. The first of these consisted in working out a technique or method of operation which should be applicable to a large scale plant; the second entailed the examination of the effect of variables (temperature, pressure, throughput, etc.) with a view to determining the best working conditions for the treatment of various raw materials. The first task has been accomplished and work on the second is in progress.

Studies of new methods of using tar and its constituents for chemical purposes are proceeding at the Chemical Research Laboratory in close collaboration with the Fuel Research Station.

## Carbonisation

High temperature horizontal retorts are used in this country for the carbonisation of between 7 and 8 million tons of coal per annum, or 40 to 50 per cent. of the total coal carbonised. In retorts of this type steaming of the charges of coal has not normally been practised. Investigations carried out in the horizontal retorts at the Fuel Research Station have shown that by a special method of steaming during the later hours of the carbonisation period the output of gas can be increased by about 10 therms per ton of coal or about 14 per cent. above normal. During this investigation one retort on the setting of eight has been isolated to allow of accurate determinations of the extent of steam decomposition when different rates of steam supply have been used. The fundamental aspects of the steaming process have received special attention during the work which is now almost completed.

The greatest interest is being taken in the low temperature carbonisation plant which has been developed at the Fuel Research Station. The hydrogenation programme is of importance in relation to the economical utilisation of the tar. The work done in the plant on the coal seams of the country has shown that a very wide range of coals can be successfully treated. This is of the greatest use in considering the developments that are taking place in low-temperature carbonisation. At least one setting of this type of retort developed at the Fuel Research Station is being erected commercially.

The intermittent vertical chamber ovens at the station are being used in an investigation on the effects, on the coke produced, of blending weakly caking coal with strongly caking coal. One of the main objects of this work is to explore the possibility of extending the life of the supply of strongly caking coals in this country. Series of blends are being carbonised at high temperatures and the conditions of carbonisation with each blend are adjusted so that the final rate of gas evolutions is as nearly constant as possible at the end of the carbonisation period with each blend.

# Electrostatic Precipitation in the Chemical Industry

## Its Fundamental Principles

THE recovery of valuable products, or alternatively of material possessing a nuisance or actually harmful value, can be accomplished with a very high degree of efficiency by means of electrostatic precipitation. This method of gas cleaning can be and is applied to practically every industrial process where it is desired to remove and collect solid or liquid particles from a gas stream.

In this country, however, it appears that a great many chemists and chemical engineers are labouring under the delusion that electrostatic precipitation is a new idea and consequently they must wait until their competitors in France, America and Germany have developed and received the benefits of this process for perhaps the next twenty years before they in the British Isles consider the idea sound enough to be used in their works. This does not apply to all British chemical works for a reasonable number of them are up to date and anxious to use any process or apparatus which will improve their manufacturing efficiency, but it is astounding to see the hesitancy with which so many people approach a subject which may be a little strange to them or which was perhaps not mentioned in their school books.

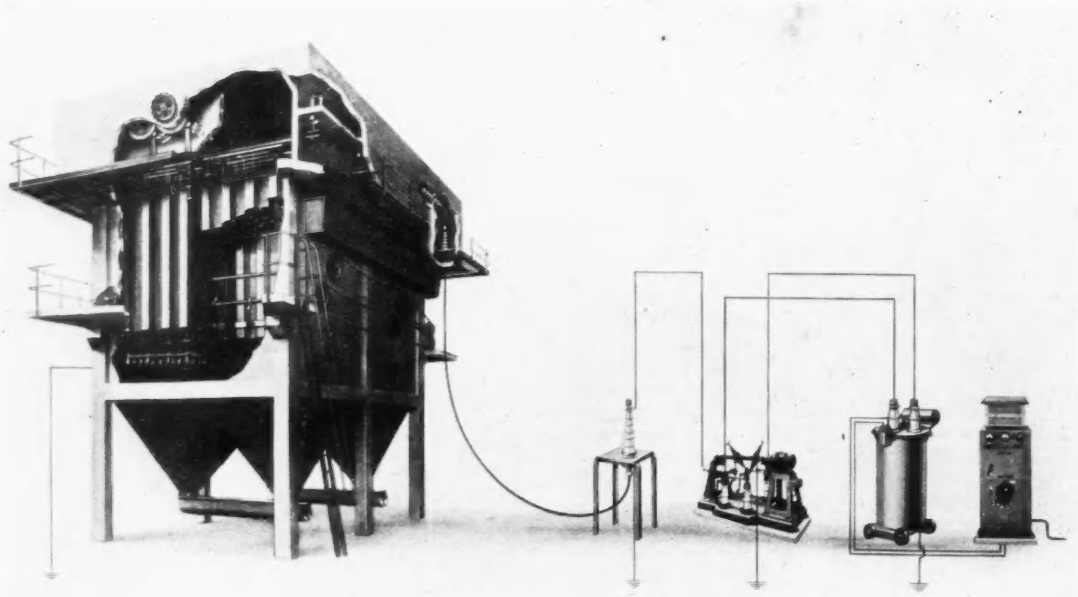

**Fig. 1.—Perspective View of Tubular Precipitator and electrical equipment for high-tension current**

The idea that electrostatic precipitation is new can be disproved by the fact that the first recorded investigation into its possibilities was made by Rafinesque, in Paris, over one hundred years ago. The process has been gradually developed since that time, until to-day there are hundreds of highly efficient and extremely reliable precipitators working in all parts of the world, some of these operating continuously for nine months to a year, twenty-four hours a day, seven days a week with no more attention than the turning of a few grease cups every day or two.

The principle of this process is not a difficult one to understand and is that if a gas carrying solid or liquid particles is passed along two electrodes, between which exists a high difference of potential, then the particles or dispersoids in the gas will be driven to the electrode having the lowest potential.

In practically every case one set of electrodes is earthed, these being termed the receiving electrodes, whilst the second set, the discharge electrodes, are connected to the negative terminal of the high-tension apparatus. This apparatus may operate at any convenient voltage between 25 kV and 80 kV, thereby providing the potential difference across the gas passing between the electrodes. Ions are formed near the discharge electrode and move at fairly high velocities across the gas, colliding, in their passage, with the dispersoids, thereby ionising these particles. This ionisation causes the particles in turn to move away from the discharge and towards the receiving electrode to which, on arrival, they adhere.

Since any type of particle can be ionised, although admittedly some are more difficult than others, and also since both the electrode systems can be built to withstand the action of corrosive gases or particles, as well as high temperatures, it has been proved in practice that electrostatic precipitators can be used with good effect on practically any gas or particle. In addition, the particles collected are found in their natural state since very seldom is any other material introduced into the treater to effect the cleaning of the gas.

Two main types of precipitators are built, the tubular and the plate. In the plate type the gas moves either vertically upward or downward or horizontally between rows of parallel plates, with discharge electrodes suspended centrally between each pair of plates. In the tubular type the tubes are always hung vertically so that the gases can only pass upward or downward. Different manufacturers seem to prefer one type or the other for large size plants, but for small, highly efficient installations, the tubular method is used in almost every case.

The discharge electrodes, as mentioned before, are suspended between each pair of plates in the plate-type precipitator, and in the tubular type are hung centrally in each tube. These electrodes, to give the best results from a purely precipitation point of view, should be made of fine wire, for the finer the wire, the greater the intensity of ionisation of the gas. It is impossible, however, due to mechanical difficulties, to use on commercial plants discharge electrodes of as fine a wire as might be found practicable on testing or experimental installations. Consequently, whilst discharge

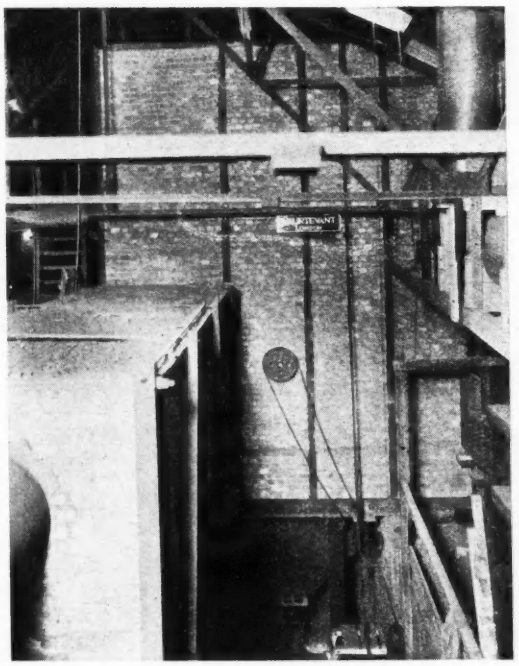

**Fig. 2.—Side Wall of Electrostatic Precipitator, showing operating gear for the hand tube rappers.**

electrodes on most commercial precipitators are made of such a size and shape of cross-section as to give a high ionisation effect, they are also made large enough to stand the various strains imposed upon them by the corrosive, erosive and dissipative effects which exist in precipitators.

Both electrode systems in plants dealing with dusty gases are provided with rapping gear, which usually consists of hammers of various types, depending upon the manufacturer's preferences, mounted on shafts and driven by motors through the necessary reduction gear. The discharge electrode rappers are usually equipped with insulated couplings so that it is not necessary to shut off the high tension current while rapping operations are being carried out.

## Source of High Tension Current

The current used on practically all precipitators is unidirectional or D.C. The main types of apparatus for producing this current are (1) the mechanical rectifier, (2) the valve, (3) the D.C. generator, and (4) the metal or copper oxide rectifier. In addition to the rectifier the other main pieces of high tension apparatus consist of a low tension control panel containing all the apparatus for controlling the high tension current from the low tension side, an auto-transformer or similar apparatus for producing a considerable variation of the voltage applied to the precipitator, and a step-up transformer which takes the low tension current from the auto-transformer and delivers high tension to the rectifier. This equipment, as well as a perspective view of a tubular precipitator, is shown in Fig. 1.

The mechanical rectifier is made in two types: (1) the rotating disc, and (2) rotating blade; for either case the action is practically the same. The rotating blade mechanical rectifier consists of an insulated rotating shaft on which are keyed two blades, the whole assembly being driven by a synchronous motor.

The valve rectifier is a very convenient type of apparatus for experimental work, and gives excellent performance in a research laboratory. It is, however, much too fragile for industrial work, and in addition its life is definitely limited to the life of the filaments. It is understood, however, that experiments are continuing on the production of a very robust valve possessing a long life, and if this is ever placed on the market at an economic price it will be a very attractive type of rectifier.

The D.C. generator produces direct current of high potential without the aid of a transformer. The motive power may be either a D.C. or A.C. motor, or a steam engine. This prime mover drives either one, two or three generators connected in series, with the positive pole of No. 1 machine connected to earth, and the negative pole of the last machine run to the precipitator.

The metal rectifier is made up of a number of copper discs coated with oxide. The oxide film presents a high resistance to current flowing in one direction, but allows it to pass in the other. In this way the pulsating A.C. is rectified to unidirectional current. This rectifier is constructed by mounting the copper discs on a central shaft, from which they are insulated. Fins are usually employed to radiate the heat generated by the passage of the current. With this apparatus the high tension transformer is required in the same way as for the mechanical rectifiers and the valve.

## Safety Precautions in Operation

All types of precipitators with their high tension sets are mechanically (and frequently electrically) interlocked so that it is impossible for an operator to enter any danger zone until all current has been switched off and the plant safely earthed.

In addition to the safety devices, equipment is always provided for the prevention of interference with wireless reception.

The two main types of precipitators which will interest those in the chemical industry are (1) where valuable material is being lost in stack gases, and (2) where some harmful substance is being carried from one part of a process to another.

An example of the first case is in the collection of such a substance as a metallic oxide. A number of these oxides have a considerable monetary value, and one precipitator we know of paid off its entire capital cost in well under a year, and since that time has been recovering material of a value of about £100 per week.

The second category (where a harmful substance is collected) is illustrated by Fig. 2, showing a precipitator collecting the dust which comes over from pyrites burners in a sulphuric acid plant. Without a precipitator considerable quantities of dust are carried to the Glover towers, flues

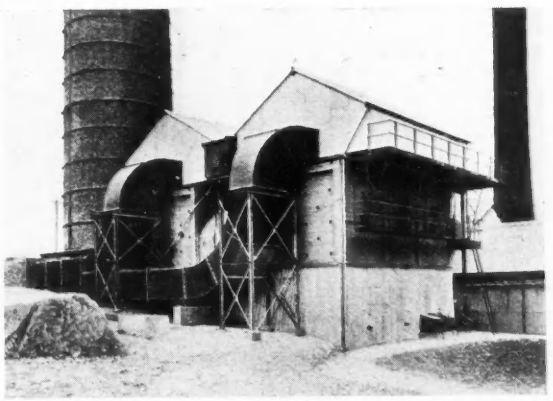

**Fig. 3.—Electrostatic Precipitator in operation at a Cement Works**

and chambers, necessitating frequent shut-downs with cleaning and washing, but after the installation of a precipitator this work is greatly reduced, and the efficiency of the whole plant increased. This can be seen from the following data:—

*Conditions before the installation of a precipitator*:

(1) Frequency of washing:

(a) For Glover towers—every 15 days;

(b) For coolers—every 8 days.

(2) Quantity of 60° Bé acid necessary for washing the towers and coolers—10 tons.
(3) Sulphur in residue from burners—3 per cent.
(4) Consumption of nitrate—approximately 1 lb. per 100 lb. of acid manufactured.
(5) Period of washing from stopping to normal running—3 to 4 hours.

*Conditions after the installation of an electrostatic precipitation plant and a continuous working of* 1½ *years* :—

(1) Frequency of washing :
  (a) Glover tower has not yet been washed.
  (b) Coolers washed every 2 to 3 months.
(2) Sulphur in residue—2.5 per cent.
(3) Nitrate consumption—0.6 lb. per 100 lb. acid manufactured.

It will be seen from this data that not only were cleaning periods greatly reduced, but in addition, more sulphur was removed from the ore, the nitrate consumption considerably reduced, and less acid wasted in washing operations.

Numerous other precipitators of both types are operating, such as those collecting the oxides of lead, zinc, molybdenum, tungsten, vanadium, etc., amongst the valuable compounds, and from the other group plants removing arsenic, tar fog and dust in blast furnace gas can be mentioned. There is, however, another group of precipitators, of which large numbers are installed, and they are those removing from flue gases the dust which would cause a considerable nuisance if delivered into the atmosphere. Of this type perhaps the largest numbers have been installed in central power stations and cement works (Fig. 3).

Chemical works executives should realise that there is a considerable amount of very modern data available as to the proper size and operating conditions for practically every type of gas and dust or mist which occurs in industrial practice and which can be dealt with by precipitators. Even if no exactly similar plants have previously been built, it is possible to determine conditions under which precipitators operate efficiently by means of pilot scale plants, and consequently there are very few problems of gas cleaning in the chemical world to-day which cannot be treated successfully by means of this process.

There are several well-known companies in this country producing electrostatic precipitators at economical prices, and we have no doubt that consultations with these firms would prove to chemists and engineers having gas cleaning problems that practically every one of their difficulties of this type could be solved with a precipitator, and in the great majority of cases one would find that the plants require practically no attention whatsoever.

# The Design of Vessels to Withstand High Internal Pressures

## Chemical Engineers Discuss Dr. D. M. Newitt's Paper

(*Continued from* THE CHEMICAL AGE, *June* 6, 1936, *page* 515)

IN types of compound cylinders so far considered the vessels have been constructed in two or more parts so that the outer layers are in an initial state of tension and the inner layers are in compression. There is consequently at each surface of contact an abrupt change in the magnitude and/or sign of the stresses.

The auto-frettage process consists in subjecting a simple homogeneous cylinder to such an internal pressure that the inner layers of the walls are stressed beyond the elastic limit into the yield or semi-plastic range and take a permanent set. On releasing the pressure the outer layers which have only been stressed within the elastic range tend to contract, but being resisted by the over-tensioned core remain in a state of residual tension and act in much the same way as a separate shrunk-on cylinder in tension. A final treatment, at low temperature, of the cylinder stabilises the residual stresses and restores the elasticity of the inner layer of metal.

### Compound Cylinder formed by Auto-frettage

To construct a cylinder according to this method it is necessary, in the first place, to have a load strain diagram covering the range of stresses used in the preliminary over-tensioning process. It is found in practice that a 2.5 per cent. strain of the inner layer of the cylinder is the maximum which can be used advantageously owing to the loss of plasticity resulting from any further increase.

A simple and convenient method of constructing or reinforcing a pressure vessel or pressure pipe line is by making use of the large compressive stresses produced by welding. If, for example, a series of weld metal beads or bands are applied to a cylinder the contraction of the fused metal imposes compressive stresses in the walls, the bands when cold being in residual tension.

The system of stresses so set up is complicated, but provided a suitable relationship is maintained between the thickness of the walls and of the bands there will be residual radial and circumferential compressive stresses throughout the walls, and longitudinal tensile stresses in the sections of wall between each band; with overloading elastic failure is found to occur by shear across one or more of the unsupported sections.

A better type of construction consists in applying the reband spirally, preferably by automatic welding, in such a way that the principal residual stresses are circumferential and radial compressive stresses and a longitudinal stress which may be compressive or tensile according to the dimensions of the band and the pitch of the spiral. The tensile stress in the band is not uniform over the cross section, but increases outwards and may have a maximum value approximately equal to the stress at the elastic limit of the weld metal.

The advantages associated with this type of construction are its adaptibility to plant of variout shapes and sizes, and its use for the construction of such vessels as commercial gas cylinders, in which the reduction of weight is an important consideration.

The following table gives a comparison of the efficiencies of the cylinders measured by the fraction of the total elastic strength of the metal utilised when the maximum permissible working pressure is applied. It will be seen that whereas for a simple cylinder the efficiency is only 21.3 per cent., a single shrinkage increases it by upwards of 50 per cent., and a double shrinkage by 100 per cent.

COMPARISON OF THE EFFICIENCIES OF VARIOUS TYPES OF CYLINDER.

| Type of cylinder. | | Maximum permissible pressure tons per sq. in. | Percentage of total strength of metal utilised. |
|---|---|---|---|
| Simple unstressed | | 28.7 | 21.3 |
| Compound | Single shrinkage | 39.22 | 36.0 |
| | Double shrinkage | 55.10 | 43.5 |
| Wire wound | | 44.92 | 43.0 |

The shrinkage method is, perhaps, best adapted to the con-

struction of comparatively small cylinders for use at very high pressure; for with increasing size the great accuracy of boring and turning necessary to ensure uniform shrinkage pressures renders the process too costly for general use. Wire or ribbon winding, on the other hand, can be applied to vessels of any size, and affords a ready and simple means of regulating the stress distribution in the underlying cylinder. By suitably adjusting the tensions in the wires from layer to layer it is, in fact, possible to construct a vessel such that when subjected to the working pressure, all parts of the walls, including the windings, will be uniformly stressed. Various combinations of wire winding and shrinking can also be used, it being a common practice to shrink end covers and an external jacket over the windings to protect them from mechanical damage and corrosion.

The auto-frettage process has a number of characteristic features not found in the shrinkage and winding processes, which recommend its use in the construction of cylindrical containers of moderate size for carrying out chemical reactions at high pressure and temperature; and provided adequate data is available on the behaviour of the steel employed when subjected to over-stressing and subsequent low temperature heat treatment, no particular difficulties are encountered in the manufacture. It is necessary, however, to have plant available for the development of the auto-frettage pressure and the whole process must be regulated by accurate measurement of the strains set up during the over-stressing operations. The advantages of the auto-frettage construction are most marked where working conditions involve fluctuations in temperature and momentary large temperature gradients in the plant.

## Points from the Discussion

The PRESIDENT (Dr. Herbert Levinstein) complimented the author upon having given a clear account of the important work carried out at the Imperial College and upon having commented in an entertaining manner upon the dangers inherent in the application of very high pressures. Referring to his own experience of the use of pressure vessels in the dyestuffs industry, the president recalled that, as a boy, he had seen some high-pressure autoclaves obtained from Krupps. The highest pressure used then was 30 atmospheres, which was regarded as dangerously high, although to-day it would be regarded as humorously low. The vessels were 5 in. thick and contained about 500 gal.; the newer vessels, which were installed not long before the war, were 2½ in. thick, and made in castings, and they were regarded as rather remarkable. When war broke out no firm in this country could supply an autoclave to operate even at that modest pressure. The long procedure involved in the making of a 15 in. gun, occupying about two years from start to finish, appealed to the layman as being remarkable; one imagined that, as the result of the great work referred to in the paper, the process could be speeded up enormously, either by the use of different metals or by different design.

## A Controversial Question

Mr. W. R. D. MANNING, discussing the duplex cylinder, where one tube was shrunk on to another, recalled some calculations he had made some years ago in which he had tried to write down the condition under which the two hoop stress peaks (*i.e.*, at the inside of the two tubes) were equal; from that condition one was able to prove that the geometric mean was an ideal. One could also find the proper shrinkage to allow and, by further complex algebra, one could discover the maximum pressure that the vessel could stand with any given limiting tensile stress in the bore. He agreed with Dr. Newitt in the use of a shear criterion rather than a direct stress criterion; and, working back to his own calculation, he had found that it became much simpler. Calculations showed that for any pressure the ideal combination in a duplex cylinder could be reached by adopting the right shrinkage, and that shrinkage was decided by the modulus and the pressure that had to be worked to. Mr. Manning raised the rather controversial question as to which factors decided the pressure at which any of the cylinders would ultimately burst, and he submitted that none of the strengthening processes put forward would affect that ultimate pressure by more than a few per cent. Bursting was the trouble to be guarded against, because the bursting of a high-pressure vessel was very unpleasant. But with any ductile materials the dilatation which occurs before bursting was very considerable and the strains were enormous—far beyond the elastic strain, and far beyond the 2½ per cent. that Dr. Newitt had mentioned for the auto-frettage. In his experience, they were oft the order of 15 or 20 per cent. in good ductile alloy steels. Therefore, in connection with vessels to be used at high pressures, although the shrinking of one tube on another would increase enormously the elastic resistance to pressure, he did not know that it would help very greatly if there were an explosion or any sudden rise of pressure near the bursting pressure of the simple cylinder.

## Effects of Temperature on Steels

Mr. A. H. TAYLOR, commenting on the author's reference to the importance of the effects of temperature on the strength of steels and the stresses due to temperature gradients, said that in certain chemical reactions carried out at high pressure in internally-heated vessels the temperature gradient had the effect of increasing the tensile stress at the bore. In those circumstances the advantage of constructing the vessel by the auto-frettage process or the shrinking process, to give a more even distribution of stress across the walls when the pressure was applied, was obvious. When, however, the reaction occurring in the vessel was highly exothermic, the temperature gradient reduced the tension at the bore and increased it at the exterior. The effect on a simple cylinder was to even up the resultant stress across the wall, whereas, with a built-up vessel the tendency was to increase the tensile stress at the outer skin above the mean. Professor Bridgman, said Mr. Taylor, had found that a thick-walled vessel subjected to internal pressure ruptured from the outside, which suggested that a smaller stress was sufficient to cause failure in the outer layer than at the bore.

At the Fuel Research Station a number of simple cylinders had been used at working pressures of only 400 atmospheres, but at temperatures up to 500° C. or more, on occasions. Several of those had ruptured during service. None of the ruptures were violent. The fissure through which the gas had escaped were scarcely discernible cracks in the outer surface after cooling.

## Means for Obtaining Increased Strength

Mr. V. A. YARDLEY, referring to the end plugs in the wire-wound explosion cylinder, said he was curious to know why they were tapered and not parallel. He wondered how the joint was made satisfactorily at the bottom and how one would know that the joint was made, because presumably the tapered plug would hardly make a tight joint. One coud hardly expect the threads to make the joint. Again, in regard to the compound cylinders the pressures at the different layers were given, showing a sudden rise. He asked if that truly represented the stresses, because it would seem that the stresses on the outside layers of the first cylinder should merge into and equal the stresses on the inner layer of the shrunk-on cylinder.

Mr. R. TAYLOR asked what strength it was possible to attain in a pressure vessel if the number of cylinders shrunk on were increased, as compared with only two or three.

Mr. B. E. A. VIGERS, referring to the practical limitations in connection with the shrinking owing to the heat treatment which was necessarily given to the cylinders in the process, suggested liquid air shrinking, and asked Dr. Newitt how much extension that would enable one to obtain. In other words, how far was one limited by the temperature that was allowable if the shrinking were done by a rise of temperature which could be recovered if the shrinking were done by a reduction of temperature of the smaller member?

Dr. NEWITT, replying to the discussion, said that the problem of the drilling of holes in vessels and of the sudden changes in stress in his cylinders was very difficult, especially in the type of ram construction with which he had dealt. He sketched a thin cylinder and said that the hole did not matter very much. At first there was a pressure of, say, 2,000 atmospheres on the inside, and then one started to drive the piston upwards. When it passed the hole there was very little difference of pressure on either side and there was not very much pressure in the cylinder. By the time a pressure of 10,000 atmospheres was obtained, the piston was near the top, whilst at the bottom there was no direct radial pressure. There were other stresses, but one did not obtain a direct pressure stress at the bottom. As the piston was driven upwards there arose a very complicated state of affairs in the walls of the vessel, due to the fact that the internal pressure dropped very suddenly to zero or to only 1 atmosphere at the bottom.

It was difficult to make a conical plug for a bomb such as he had illustrated, because when the plug was screwed right home the bearing surface on the end of the plug must be hard down on the seating, so that there was not much space to play with, and it depended rather on accurate measurement of the distance of the seating to the end of the plug as to whether or not one obtained a tight joint. The copper washers were of rather peculiar shape; the plug came down and hit the copper washer on almost a point, and when it first touched the copper washer the plug was not quite home.

### Use of Liquid Air for Shrinking

Dealing with Mr. Viger's question concerning the use of liquid air, he said he would not suggest using liquid carbon dioxide, which gave an advantage of only 50° or 60° in temperature, so that it was hardly worth while. The use of liquid air would be better, but he did not know how far the cost would be justified. A tremendous amount of liquid air would be required in order to reduce a fair-sized cylinder to its liquefying point. If that could be done, and if the cold had not any adverse effect on the impact quality of the steel, it might be a very good idea.

With regard to a question as to the strength of a pressure vessel in which the number of cylinders shrunk on were increased to infinity, Dr. Newitt said he had applied the shrinkage construction method to a vessel of five cylinders shrunk one over the other. The calculations became very laborious, but the cylinder was certainly becoming stronger and stronger, and he hazarded a guess that by using an infinite number of cylinders one would be able to employ 50 per cent. of the total strength of the steel, but not more.

## Anglo-Argentine Trade

### Views of United Kingdom Industrialists

NOW that negotiations have been started for a new Anglo-Argentine Trade Agreement to replace the so-called Roca-Runciman Agreement, concluded in 1933, the Tariff Committee of the Federation of British Industries have been considering what attitude they should take up. Views both on the working of the current agreement and as to the new agreement which is to take its place are already being put forward by interests representing British companies established in the Argentine.

The conclusions arrived at by the Tariff Committee can be summarised as expressing the belief of British industry that the working of the Roca-Runciman Agreement has constituted a progressive stage in United Kingdom export trade to the Argentine and that, given certain amendments and improvements which it is hoped may be embodied in the new agreement, there are good prospects for a continuation of the progress made during the past 2½ years. As regards the existing agreement, it has secured for British exporters a reasonable settlement of the debts which were outstanding at the beginning of 1933, increased exports to the Argentine from the United Kingdom in 1935 of about 2¼ million pounds over the 1933 figures and the provision of adequate exchange at the official or preferential rate for British exports to the Argentine.

With regard to the new agreement to be negotiated, United Kingdom industry is pressing *inter alia* the following further points:—(1) The removal on a number of classes of articles of the 10 per cent. surtax. The Argentine Government promised in the 1933 agreement to give favourable consideration to this but have not yet seen their way to carry it out. (2) The removal of the element of instability in the difference between the official and free rates of exchange for the payment of United Kingdom goods. (3) Some measures which will tend to prevent the competition to which United Kingdom exports to the Argentine have been subjected from certain other countries.

In conclusion, the Federation's Tariff Committee believe that there is much to be gained, in view of the inter-connection of Anglo-Argentine trading interests, from a progressive increase of trade in both directions which can only be achieved if a measure of stability is given to such interchange.

## Radioactivity in Aluminium

### Mme. Joliot-Curie in London

MME. IRENE JOLIOT-CURIE, who, with her husband, has discovered a new radioactive element in aluminium, spoke of their researches to members of the Medical Association of the International Clinic, at Wigmore Hall, London, on June 5.

Lord Lytton, who presided, congratulated Mme. Joliot-Curie on her appointment as Under Secretary for Scientific Research in the new French Socialist Government. He described the discovery of the new radioactive element as having carried a stage further the great discovery of radium by Mme. Joliot-Curie's distinguished mother. The cheapening of radium which must result from such a discovery, he added, would be far more beneficial to mankind than the cheapening of gold could have been. They had converted one of the baser metals into something much more valuable than gold.

Mme. Joliot-Curie, who spoke on "The Synthesis of New Radioactive Elements," explained that by bombarding aluminium with rays comparable with X-rays, she and her husband had been able to transform a commonly occurring and inert element into a radioactive element. During the last four years, she said, there had been rapid developments in this field of scientific research. Discoveries had been made in many countries, and progress had been so rapid because all those countries had worked together, and each discovery had helped another.

## Untarnishable Silver

### An Increased Use of Rhodium Metal

THE recently-discovered process for rendering silver untarnishable by the use of rhodium is likely to have important implications for the International Nickel Co. of Canada.

The new "rhodanising" process, which is patented in this country by Baker Platinum, Ltd., is comparatively simple to operate, and it can be applied to old as well as new silver. It is expected to be popular because it eliminates cleaning and enables silver to be displayed without its appearance deteriorating from day to day. Unlike lacquers and varnishes which have hitherto been extensively used, the rhodium finish is unaffected by heat and does not chip or crack.

Until a few years ago the world supplies of rhodium—one of the six platinum metals—were very limited, but Canadian production has been extensively developed by the International Nickel Co., which now controls the bulk of the world's output. The metal for English requirements is produced at the Mond Nickel refinery at Acton.

# What we have Learned from Interviewing Members of Trade Associations*

IN writing for business papers we have interviewed many members of trade associations. What has impressed us most is the different attitudes and reactions displayed toward association work by individuals united for co-operative effort toward a common goal. Although the fields covered vary from plumbing and heating to bakery products or automotive merchandise, we find that members of all trade associations fall into six general classifications. These classifications may not fit your particular association, but here they are for your edification or diversion.

1.—*The Wheel Horse.*—An association member who appreciates the value of teamwork and realises that co-operative effort gets the load to the top of the hill. The wheel horse is always in harness working for association betterment, never needs the whip. At convention time he does more than sing "The old gray mare." He knows that pulling alone gets him nowhere, but brains and money pooling together is horse sense. Often he makes sacrifices to the detriment of his own business and health, unselfishly tugging at the traces for the common good. Unhitch the wheel horses and into the rut goes the trade association.

2.—*The Flea.*—Jumps on the membership rolls one year, jumps off the next. Usually "joins up" after the association has pulled a master-stroke of some kind, or sometimes sensing a threatening development he jumps to association shelter until the storm passes, then discontinues membership again. If he's lucky to survive, he does his flea act whenever propitious and so on *ad infinitum*. The flea never discontinues his fire or life insurance, but business insurance —that can do a fade-out any time. From our contacts with the flea we find that usually the real reason for his resignation is his desire to save money, but his methods indicate to anyone experienced in business practices that he's blind as a bat.

3.—*The Pouter Pigeon.*—Remember the spoiled child who picked up his marbles and went home when the game didn't suit him? He has grown up, gone into business and joined a trade association. But his mind works the same as in his marble days. He's still a spoiled child. Toward all co-operative efforts on the part of his broadminded fellow members he displays petulance, criticises, is defiant or apathetic. He shows his "independence" by refusing to attend meetings, withholding support when support is needed most but quickly criticises the busy bees working continuously to right wrongs and to bring more milk and honey to all. The pouter pigeon forgets the constructive association work which benefits him every day, but regarding fancied slights or minor errors, even in the distant past, his memory is elephantine. Although he cashes in on the benefits of his association, he always complains, "We would have made greater strides if things had been handled by more competent men." Often the pouter pigeon becomes a flea, then his excuse for jumping off the association band-wagon is, "I didn't like the fellows running it," "I find I can get along as well without it," "It never did me much good anyhow."

4.—*The Sloth.*—Receives favours but renders none. Joins an association only for what he thinks he can get out of it, not realising that you get out of an association about what you put in it—with interest. Direct benefits, such as savings effected or losses avoided in specific instances are easy to credit to the source but it is hard to compute indirect association benefits, which are most important. Many association members have told us that affiliations made through contacts with other members and their friends have helped them solve many problems and increase profits. Through association bulletins and services, in meetings and at conventions, members capture that *rara avis of business*—new ideas and fresh viewpoints without which every executive is ready for the taxidermist.

5.—*The Nightingale.*—Belongs to an association mostly to get a chance to warble "Sweet Adeline" with the usual accompaniments at conventions and local shindigs. Seldom asks for or digests advice on modern business methods or operating procedure given by his association or trade papers. From observation, we can say that the nightingale's organisation usually looks as old as "Sweet Adeline." Likewise his methods. But, being a good mixer, the nightingale sometimes keeps out of failure's trap without taking advantage of the many helps offered by his association and trade papers. He'd do much better if his business equipment and methods played a modern tune.

6.—*The Chameleon.*—Attends meetings more to find out what others are doing than to offer co-operative services. Swears undying co-operation "for the good of our business," whenever the local boys get together to discuss problems, but forgets all about it the next day and does as he pleases. The chameleon is the first to slash prices indiscriminately, disrupt competition with profitless estimates and to do other things that undermine co-operation and destroy faith in the attainment of objectives without which no association can succeed.

*Now, a word about the Ostrich.*—This bird is always howling about the difficulty experienced in solving some problem, which the association in his field or the trade papers have already solved, yet he never "joins up" and seldom reads his trade papers even if he subscribes, but continues to hide his head in the sand under the false assumption that the big, bad wolf of business inefficiency won't dig in after him. Our investigation has shown that the ostrich usually can afford it and is eligible to membership in a responsible association, his record is clean, yet he never tries to get out of the jungle of bad management via that dependable combination—trade association and trade papers. Why? That's something we've never been able to figure out.

* Reprinted from a contributed article in "The American Dyestuff Reporter," May 18, 1936.

## Merchants and Manufacturers

### Kelly's Complete World Directory for 1936

"KELLY'S Directory of Merchants, Manufacturers and Shippers of the World" for 1936, which is the fiftieth edition of that work, has just been published. This directory consists of two volumes, the first containing information concerning all the countries of the world except the British Empire. In the second volume, devoted to the British Empire, the section for Great Britain and Ireland is divided into three parts: (1) England, Scotland and Wales (except London); (2) London; (3) Ireland. Each part contains an alphabetical list of and importers arranged alphabetically under the headings a list of telegraphic addresses, and separate lists of exporters and importers arranged alphabetically under tmhe headings of goods in which they deal. Pages at the end of the section for Great Britain and Ireland contain reproductions of trade marks. Regulations in force for commercial travellers in all parts of the world will be found in Vol. 2.

A feature for which this directory is noted is its careful annual revision on which a far-reaching and extensive organisation of agents is engaged; thousands of correspondents throughout the world also co-operate in this important work. It is most important to users of the directory that they be kept abreast of the thousands of alterations to the names and addresses of firms which have been made in all countries. As an instance may be mentioned the altering of the name of Santo Domingo to Ciudad Trujillo.

The directory, price 64s. post free, is published by Kelly's Directories, Ltd., 186 Strand, London, W.C.2.

# British Standards Institution

## Annual Meeting and Luncheon

THE annual general meeting of the British Standards Institution was held at the Institution of Mechanical Engineers, on June 4, under the chairmanship of Mr. W. Reavell, M.I.Mech.E. Mention was made of the forthcoming visit of the director to New York and the Argentine in connection with the work of the newly-formed Argentine Institute for the Rationalisation of Materials.

At the luncheon at the Royal Automobile Club which followed the meeting, Lord Riverdale, who was the chief guest, proposed the toast of the Institution and referred to the very economic manner in which the work was carried out dealing as it now does with some 800 committees and over 1,000 meetings a year. He said he felt that " Empire Standards " was one of the ways in which it was possible to bind the Empire together and consolidate Empire trade. Some people feared that standardisation meant stagnation, but this was provided against in the precautions the B.S.I. took when standards were brought into being and in the frequent review and revision of those standards. Industry, in his view, did not fully appreciate the value of standardisation in the matter of capital expenditure. It meant the possibility of reduction of stocks which in turn meant liberating capital and this might amount to millions of pounds in the British Empire. Co-operation with the United States and with South America was, he thought, all to the good and he was glad to see the efforts being made in this direction.

Mr. Reavell, the retiring chairman, thanked Lord Riverdale for his invaluable aid, and remembering the recommendations of the Government Committee on Industry and Trade, over which Lord Riverdale had presided, he suggested they might persuade him to help them once more when the Government was approached for an increase in their grant to this great national work.

Mr. E. J. Elford, the chairman for the forthcoming year, in proposing the toast of " Those associated with the B.S.I.," said that the organisation was greatly indebted not only to the Government for their continued financial support, to the many technical officers of the various Government Departments for their assistance on the technical work, but also to the hundreds of representatives of industry, using that word in the widest sense, who gave their time and experience so willingly to this work of growing national importance.

Colonel Briggs, of Unilevers, Ltd., expressed the satisfaction of the chemical industry at the work already undertaken by the Institution in the chemical field and their desire to co-operate in any future work which was the industry felt desirable to carry out.

# New Fireproof Structural Material

## Plywood Reinforced with Asbestos Cement

CLAIMED to combine the fireproof, insulating and other useful properties of asbestos and asbestos-cement with the workability and durability of wood, a structural material, which is likely to find extensive application in the chemical industry in Great Britain, is to be developed on a large scale by Plybestos, Ltd., a new British company.

This material, known as " Xylotekt," is already in extensive use on the Continent, and has figured prominently in the construction of walls and equipment in many large liners, notably the *Normandie*, the *Bremen* and the *Europa*. It consists of plywood reinforced with asbestos-cement on the outside or between the plys, the asbestos-cement being permanently compressed to the plywood core under extreme hydraulic pressure. It can be used structurally or affixed to adjoining wood or steel work with the aid of rivets, screws or nails, and it can be machined, painted, polished, glazed and in other ways treated as wood.

For fire protection and thermal installation its advantages appear to be great, whilst its ability to resist impact without breaking, to combat acid fumes and other means of chemical attack, its damp-resisting qualities, and the fact that it is a non-conductor of electricity, extend considerably its sphere of usefulness in the chemical industry. The applications of this material at the moment cover an enormous number of structural and building operations. They range from fireproof and damp-proof doors, walls, ceilings, and electrical switchboards, to laboratory tables, cold storage linings, coal chutes, and as a replacement of timber and steel containers in agricultural, processing and other machinery.

The material has already aroused the interest of a number of architects and engineers in this country, and at the present time it is undergoing extensive trials at the National Physical Laboratory. It is worth noting that asbestos-cement reinforced plywood was a subject of recent tests in Belgium, designed to ascertain the most suitable material for employment in the construction of hermetic and tight doors and shutters for anti-gas and anti-fire shelters.

# I.G. Farbenindustrie

## Sales Slow Down in 1935

THE annual report for 1935 of the I.G. Farbenindustrie, of Frankfurt, which produces about a third of the output of the German chemical industry reflects a slowing down of the upward tendency of sales in recent years, although an unchanged dividend of 7 per cent. has been announced.

No figures of the sales are given, but it is stated that the turnover has advanced in proportion to the increase of the staff, the number of which last year only grew by 5 per cent., whereas in 1934 it had increased by 18 per cent. The total staff of the I.G. Farbenindustrie and its subsidiaries at the end of 1935 aggregated 148,205, of which 114,306, against 108,557 a year ago, were employed by the parent company itself. This slowing down of the upward tendency is also indicated by the fact that operating profits last year have only increased by 8 per cent. to Rm.611,936,000, whereas in 1934 they had increased by 15 per cent. to Rm.565,070,000.

Expenses have advanced at a much heavier rate, partly due to larger amounts required for the staff and for the export subsidies. The amount of the latter a year ago was said to be approximately Rm.60,000,000, but no confirmation for this figure could be obtained. In 1935 the company spent Rm.94,902,000, against only Rm.77,075,000, for extension and renovations of its plants, the book value of which thus was increased from Rm.395,861,000 to Rm.423,109,000.

Notwithstanding substantial reductions of the deductions the net profit of the I. G. Farbanindustrie has only slightly advanced to Rm.51,439,800 from Rm.50,981,100 in 1934, out of which an unchanged dividend of 7 per cent. is distributed on the Rm.680,000,000 share capital, Rm.4,040,000 against Rm.4,780,000 being carried forward.

One of the main tasks of the company during the past year was the further extension of the means for production of raw materials in this country, in which connection synthetic rubber, aluminium, artificial silk, staple fibre, and petrol from lignite are mentioned. The company's output of petrol has increased by about 60 per cent. Sales of dyes have increased as to tonnages, whereas their value remained unchanged.

With Imperial Chemical Industries, Ltd., of London, blue pigment dyes called " Heliogenblau " have been produced, in which the varnish industry showed a great interest. The co-operation with the Imperial Chemical Industries and other big European dye producers proved to be satisfactory. Foreign sales of chemicals have substantially increased. With the Unilever combine an agreement for the development of non-soap-containing washing processes was concluded. Sales of nitrate have grown as to tonnage, but the value of the sales could not keep pace with the volume, although exports have increased at maintained prices.

# Letters to the Editor

### Poisons List and Poisons Rules

SIR,—It was anticipated that numerous difficulties of interpretation would arise in connection with the new Poisons List and Poisons Rules, especially in regard to their application to shopkeepers who were listed sellers of Part II poisons. For this reason one welcomed the various guides which different organisations and individuals published, such as the memorandum affecting shops other than chemists' shops issued by the Home Office, "Poisons Law" by Mr. Hugh N. Linstead, the secretary of the Pharmaceutical Society, and the guide published by "The Grocer" entitled "Requirements of the Pharmacy and Poisons Act, 1933, and the Poisons Rules in the Retail Sale of Poisons by Listed Sellers."

It is very disquieting to find that some of the inspectors appointed by local authorities are trying to insist on interpretations which are completely at variance with the Poisons Rules, thereby causing much confusion among listed sellers with consequential unnecessary interference with business. The following are a few typical instances:—

(a) The insistence that potassium ferricyanide is a listed poison. This compound is not included by name in the Poisons List. Furthermore, it is not covered by the item "cyanides," since chemically it is not a cyanide. It is therefore entirely outside the poisons regulations.

(b) The ruling by an inspector that under Rule 14 (b), disinfectants in tins with screw-on stoppers cannot be sold by listed sellers, on the ground that the container is not properly sealed. Rule 14 (b) makes no reference to sealing, but merely requires that disinfectants be sold by shopkeepers in "closed containers as closed by the manufacturers, etc." The tin in question complies entirely with this rule and with Rule 22 (1) (a) regarding the form of containers.

(c) The statement by inspectors in several areas that coal-tar disinfectants may not be exhibited for sale, but must only be kept in a cupboard. This is entirely at variance with the requirements of Rule 23 (2) re storage of poisons, which refers solely to First Schedule poisons, among which phenolic disinfectants are not included. One inspector has gone so far as to insist that the disinfectants must be out of sight of the public.

Such erroneous interpretations on the part of inspectors in regard to quite simple points are particularly to be regretted, because of the confusion which they produce in the application of the Poisons Rules. It is hoped that local authorities will take steps to ensure that their inspectors have a correct appreciation of the significance of the Rules and do not apply wrong interpretations. They are advised to study carefully the excellent memoranda which the Home Office is issuing regarding the application of the Rules to various classes of traders. Listed sellers who are faced with interpretations which appear inconsistent with the Rules are advised to consult their trade associations before taking action.

This Association, and the Association of British Chemical Manufacturers, to which it is affiliated, have made a close study of the Rules since they were first issued in provisional form, and will be glad to advise in cases of difficulty.—Yours faithfully,

J. DAVIDSON PRATT,
Secretary.

The British Disinfectant Manufacturers' Association,
166 Piccadilly, London, W.1.

# Selenium in the Rubber Industry

By T. L. GARNER, F.I.R.I.

THE relationship between oxygen, sulphur and selenium is well known, but while oxygen and sulphur have long been relatively cheap commercial products, selenium has only recently been available at a price which enables it to be used to any extent commercially. The potential production is much above the total at present required. Considerable activity has been noted in research to discover new fields of application, but, in general, success has been in the medicinal or chemical industries, with a small aggregate amount required. If a really big opening for this element could be found, the quantities produced could be largely increased, since at present only small demand prevents the extensive working-up of residues from copper and lead refining processes, in which selenium is to be found.

### Selenium Cells

Selenium is isomorphous with sulphur and like the latter, exhibits three known allotropic modifications: (1) Amorphous, formed as a fine red precipitate when sulphur dioxide is passed through a solution of selenious acid. (2) Vitreous, formed when amorphous selenium is heated to about 217° C. and rapidly cooled; this variety as a black, brittle, lustrous substance which softens at 100° C. and is molten at 250° C., but exhibits no definite melting point. (3) Metallic selenium is obtained when the vitreous variety is heated to 210° C. for some time, the mass suddenly melting and metallic selenium being deposited on cooling as steel-grey, hexagonal crystals; this change takes place at lower temperatures in a longer time.

Only metallic selenium will conduct electricity, and it is, therefore, the only variety suitable for use in selenium cells. An important property of selenium is the lowering of its electrical resistance upon exposure to light; the action is principally produced by the red rays and is proportional to the intensity of the light. However, since the change is not instantaneous, selenium compares unfavourably with the potassium photo-electric cell, although the latter is considerably more costly.

The conductivity of electricity by selenium is dependent on the intensity of the light, and this characteristic property has led to the development of the selenium cell. Such cells are used industrially in many ways, for example in the self-lighting buoy, control apparatus for chimney draught, the control of the progress of sulphuric acid manufacture by the contact process, and many other purposes, but its use is limited to some extent by the fact that the recovery of its absolute resistance upon change from light to dark is not instantaneous. There has been improvement in this connection of recent years, however, but in competition are the potassium photo-electric cell and the copper oxide cell.

### General Uses of Selenium

Selenium oxychloride, which is a heavy, almost colourless liquid, is a very powerful solvent. The synthetic resins which now are the basis of a large and growing industry, were formerly regarded as being insoluble, but they are readily soluble in selenium oxychloride; this solvent may be used more extensively as its value in this connection becomes more fully realised.

Perhaps the principle use of selenium and its compounds, at least as regards quantity, is as a decolouriser in the glass industry and in the manufacture of ruby glass. In the former connection it is used to neutralise the green tint imparted by traces of iron, and in the latter for the production

of danger signals, etc. Another important use is the flameproofing of electric switchboard cables, where short circuits are occasionally caused by the collection of dust, resulting in the firing of part of the cable covering. If, however, the cable is treated with a thin layer of metallic selenium, a remarkable flameproofing is effected. The use of fine-drawn selenium wire is extending to some extent, wires with as small diameters as one millimetre to one micron being possible.

### Rubber Manufacture

For rubber manufacture the selenium used is the steel-grey modification, which is insoluble in carbon disulphide. It has been known for many years that selenium will effect vulcanisation in a similar manner to sulphur, but in recent years it has been established that using it as an additional compound to sulphur in a rubber mixing, very definite properties are imparted to the finished product. The most important property claimed when selenium is used in conjunction with sulphur and an accelerator, is toughening of the vulcanised rubber, together with increased hardness and resistance to abrasion. The usual amount recommended is about one per cent., based on the percentage of rubber in the mixing, and if slightly more is used, the rubber after vulcanisation will show a very characteristic greenish bloom of selenium. It is claimed that its use reduces the tendency of sulphur to bloom out of unvulcanised rubber, by presenting crystals, which are amorphous with sulphur, and so cause uniform internal crystallisation of sulphur. The use of larger amounts of selenium, about eight per cent. on the rubber, is recommended for flameproof rubber goods.

### Improved Abrasion Resistance

Much interest was aroused a few years ago when a claim was made by two American investigators, Bierer and Davis, that marked improvements in abrasion resistance of tread compounds could be obtained by its use. In a report on a tread rubber, containing a proportion of reclaimed rubber, they found that the addition of only 0.5 per cent. of selenium increased the relative abrasion resistance by about 50 per cent.; an increased addition of 1.25 per cent. did not give a further improvement in abrasion resistance.

This was more fully described in a publication by Boggs and Follansbee of their researches into the effects of selenium on this most important property. It is interesting to quote from the summary of this paper:—"It is shown that selenium acts as a vulcanisation agent to produce soft vulcanised rubber. When selenium and sulphur are used together to produce soft vulcanised rubber, the selenium acts as an efficient accelerator as well as a vulcanising agent. Tyre tread compounds vulcanised with selenium and sulphur in the presence of organic accelerators show abnormally high rigidity and abrasion resistance. This result is obtained with a variety of filling materials and accelerators. The other physical properties are practically not affected. It is suggested that the accelerating action produced by selenium is due to selenium sulphide and that the abnormal physical results are due to the selenium and sulphur together adding to the rubber molecule. The results given in the paper showing the improved abrasive resistance of selenium—containing rubber compounds were confined on six different types of abrasion machine, seven tests in all being carried out by different laboratories only one of which failed to show markedly improved abrasion resistance.

### Work of Many Chemists

Many chemists in the rubber industry, who had, prior to the above publication, experimented with selenium in rubber with but indifferent results, were inspired to further efforts and there can be no doubt that after 1926 many laboratories bethere can be no doubt that after 1926 many laboratories belonging to rubber factories were endeavouring to repeat and confirm the experiments described by Boggs and Follansbee. The improvement of abrasive resistance of rubber compounds is a matter of such great importance that no factory of standing can afford to neglect any opportunity of using any new method to this end. It was fairly soon apparent, however, that in European countries the desired confirmations were not being obtained, and doubts were thrown on the accuracy of the previous work in various quarters before the first publication by Twiss definitely stated that, although he had completely reproduced the experiments of Bierer and Davies so far as possible, he found only small and irregular variations in abrasion resistance.

Other investigators since, in particular the German chemist Rimpel, have published experiments showing that improved abrasion figures were not obtained when using selenium, confirming laboratory tests by road tests on tyres. Despite the discouragement which such results caused in rubber laboratories, investigations and developments of the uses of selenium proceeded, and gradually the material has become to be regarded as a valuable constituent of certain types of rubber mixing. This is particularly the case in low sulphur-containing mixings, where good ageing properties are required; the use of selenium, in conjunction with powerful accelerators, gives a rubber product with exceptional resistance to heat.

# The Chemical Age Lawn Tennis Tournament

## Second Round Draw

THE draw for the second round of the sixth annual CHEMICAL AGE Lawn Tennis Tournament was made on Tuesday, the details of which are published below. Owing to the inclement weather during the early part of the period allotted for the first round, several players were regretfully compelled to scratch their matches, and one or two were delayed for a few days. The results of the postponed matches are due to reach us this week-end, and the competitors affected will be notified immediately of their position in the tournament. Mr. Tunstall, of Liverpool, a former runner-up in the singles, has had the misfortune to tear a muscle while playing in a local tennis tournament and has had to withdraw from this year's competition. Mr. J. Haines, the winner, and Mr. R. N. Bruce, the runner-up, in the 1935 Singles Tournament, have also scratched in the first round.

**All matches in the second round must be played by July 6,** and the results communicated to the Editor, at Bouverie House, 154 Fleet Street, London, E.C.4, by the first post on Tuesday, July 7. Results of matches played in the second round will be published as they come to hand each week, and details of the draw for the third round—a new draw being made for each round of the tournament—will be published in THE CHEMICAL AGE of July 11.

Entrants are reminded that the result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers) immediately after the match, and in any case, not later than first post on the morning following the final day for playing off the round.

In addition to the first round results already published, the following have been received:—

SINGLES

A. E. Hughes (Limmer and Trinidad Lake Asphalt Co., Ltd.) beat J. I. T. Jones (The Mond Nickel Co., Ltd.), 6—3, 6—4.

L. A. Maronge (Bakelite, Ltd.) beat P. Smith (Bakelite, Ltd.), 6—3, 7—5.

J. H. W. Turner (Griffiths Bros. and Co. (London), Ltd.) beat D. Bovaird (The British Drug Houses, Ltd.), 6—1, 6—0.

W. R. Lewis (The British Oxygen Co., Ltd.), beat L. Seabrook (The British Oxygen Co., Ltd.), 6—2, 6—3.

R. M. O. Williams (Chance and Hunt, Ltd.) beat R. J. Sleap (United Yeast Co., Ltd.), 7—5, 3—6, 10—8.

R. F. Welsh (The British Oxygen Co., Ltd.) beat H. A. Steel (Society of Chemical Industry), 6—2, 5—7, 6—0.

A. W. A. Goudie (Tar Residuals, Ltd.) beat G. Brewer (British Celanese, Ltd.), 8—6, 6—0.

E. A. Thomsett (The British Oxygen Co., Ltd.) beat R. E. Liston (Jnr.) (Walter Carsons and Sons, Ltd.), 6—1, 4—6, 6—3.

C. G. Copp (Doulton and Co., Ltd.) beat E. D. Lacey (Murex Welding Processes, Ltd.), 6—4, 6—8, 6—2.

H. G. Waters (Anglo-Iranian Oil Co., Ltd.) beat B. T. Francis (Bakelite, Ltd.), 6—0, 6—2.

W. Hoppe (Johnson Matthey and Co., Ltd.) walk over, R. N. B. D. Bruce (South-Eastern Gas Corporation) scratched.

F. G. Hawley (Anglo-Iranian Oil Co., Ltd.) walk over, P. A. Tunstall (Salt Union, Ltd.) scratched.

E. Pavitt (Co-operative Wholesale Society) beat E. Whittaker (A. C. Wells and Co., Ltd.), 6—2, 6—1.

J. Eager (Griffiths Bros. and Co. (London), Ltd.) beat P. D. O'Brien (B. Laporte, Ltd.), 6—3, 8—6.

A Cosgrove (Hanovia, Ltd.) walk over, P. L. Lucas (British Drug Houses, Ltd.) scratched.

V. J. Prosser (John Haig and Co., Ltd.) beat G. Walton (The British Oxygen Co., Ltd.), 6—1, 6—2.

DOUBLES

V. D. Thompson and A. S. Lewis (Stafford Allen and Sons, Ltd.) walk over, G. McThiesen and G. W. Hole (Asiatic Petroleum Co., Ltd.) scratched.

G. J. Brewer and A. W. A. Goudie (British Celanese, Ltd.) beat A. J. Truslove and W. Wakeman (Johnson Matthey and Co., Ltd.), 6—3, 7—5.

R. D. Hayman and C. G. Copp (Doulton and Co., Ltd.) beat A. F. Eyres and W. Hoppe (Johnson Matthey and Co., Ltd.), 6—4, 2—6, 6—2.

A. W. White and R. H. Hornsby (Howards and Sons, Ltd.) beat B. T Francis and P. Smith (Bakelite, Ltd.), 6—1, 6—4.

V. J. Prosser and A. Baxter (John Haig and Co., Ltd., and United Yeast Co.) walk over, R. J. Sleap and J. Buisson (United Yeast Co., Ltd., and Honeywill and Stein, Ltd.) scratched.

W. Speakman and S. E. Chaloner (Monsanto Chemicals, Ltd.) walk over, J. S. Boyd and D. A. Manlove (Imperial Chemical Industries, Ltd.) scratched.

## Second Round Draw

### Singles

**Woodcock, C. T.**
British Tar Products, Ltd., Hayes Road, Cadishead, Manchester. (Irlam 87.)

*v*

**Gough, C. C.**
Lever Bros., Ltd., C.T.D/G. Dept., Port Sunlight, Cheshire. (Rock Ferry 500.)

**Pavitt, E.**
Co-operative Wholesale Society, Drug Works, Greenside Lane, Droylsden, Manchester. (Droylsden 1348.)

*v*

**Neason, F.**
Alfd. Herbert, Ltd., Edgwick Works, Foleshill, Coventry. (Coventry 8781.)

**Thomsett, E. A.**
The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2488.)

*v*

**Turner, J. H. W.**
Griffiths Bros. & Co. (London), Ltd., Macks Road, Bermondsey, S.E.16. (Bermondsey 1151.)

**Hawley, F. G.**
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. (National 1212.)

*v*

**Goudie, A. W. A.**
Tar Residuals, Ltd., 4, Lloyd's Avenue, E.C.3. (Mayfair 8000, Ext. 218.)

**Cornelius, L.**
Stafford Allen & Sons, Ltd., 7, Cowper Street, Finsbury, E.C.2. (Clerkenwell 2100.)

*v*

**Grape, L. F.**
Borax Consolidated, Ltd., Regis House, King William Street, E.C.4. (Mansion House 8332.)

**Maronge, L. A.**
Bakelite, Ltd., 68, Victoria Street, S.W.1. (Vic. 5441.)

*v*

**Hanson, G. A.**
Whiffen & Sons, Ltd., Carnwath Road, Fulham, S.W.6. (Fulham 0037.)

**Welsh, R. F.**
The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2488.)

*v*

**Hughes, A. E.**
Limmer & Trinidad Lake Asphalt Co., Ltd., Artillery House, Artillery Row, S.W.1. (Vic. 8313.)

**Waters, H. G.**
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. (National 1212.)

*v*

**Eager, J.**
Griffiths Bros. & Co. (London), Ltd., Macks Road, Bermondsey, S.E.16. (Bermondsey 1151.)

**Copp, C. G.**
Doulton & Co., Ltd., Lambeth, S.E.1. (Reliance 1241.)

*v*

**Crosse, F. G.**
Society of Chemical Industry (Bureau of Chemical Abstracts), 46/7, Finsbury Square, E.C.2. (Met. 3773.)

**Blow, D. G.**
British Drug Houses, Ltd., 16-30, Graham Street, City Road, London. (Clerkenwell 3000.)
or
**Bennett, R. A. J.**
Nobel Chemical Finishes, Ltd., Wexham Road, Slough, Bucks. (Slough 528.)

*v*

**Hand, F. D.**
B. Laporte, Ltd., Luton, Beds. (Luton 891.)

**Thompson, V. D.**
Stafford Allen & Sons, Ltd., 7, Cowper Street, London, E.C.2. (Clerkenwell 2100.)

*v*

**Wilson, J. S.**
British Celanese, Ltd., 22/3, Hanover Square, London, W.1. (Mayfair 8000, Ext. 137.)

**Truslove, A. J.**
Johnson Matthey & Co., Ltd., 78, Hatton Garden, E.C.1. (Hol. 6989 (Mr. Braby).)

*v*

**Cosgrove, A.**
Hanovia, Ltd., Bath Road, Cippenham, Slough, Bucks. (Burnham (Bucks) 500.)

**Williams, R. M. O.**
Chance & Hunt, Ltd., 5-7, St. Helen's Place, London, E.C.3. (National 4024, Ext. 7.)

*v*

**Lewis, W. R.**
The British Oxygen Co., Ltd., Angel Road, Upper Edmonton, N.18. (Tottenham 2488.)

**Hoppe, W.**
Johnson Matthey & Co., Ltd., 78, Hatton Garden, E.C.1. (Hol. 6989 (Mr. Braby).)

*v*

**Prosser, V. J.**
John Haig & Co., Ltd., 2, Pall Mall East, S.W.1. (Whitehall 1040.)

**Baxter, A.**
United Yeast Co., Ltd., 238, City Road, London, E.C.1. (Clerkenwell 0303.)

*v*

**Hudson, J.**
Bakelite, Ltd., 68, Victoria Street, London, S.W.1. (Vic. 5441.)

**Hayman, R. D.**
Doulton & Co., Ltd., Lambeth, S.E.1. (Reliance 1241.)

*v*

**Tickner, A.**
British Celanese, Ltd., Celanese House, Hanover Square, W.1. (Mayfair 8000, Ext. 137.)

### Doubles

**Thompson, V. D., & Lewis, A. S.**
Stafford Allen & Sons, Ltd., 7, Cowper Street, E.C.2. (Clerkenwell 2100.)

*v*

**Triggs, A. E., & Tinkler, R.**
Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, E.17 (Larkswood 2284.)
or
**Allen, F. R. O., & Bennett, R. A. J.**
Nobel Chemical Finishes, Ltd., Wexham Road, Slough, Bucks. (Slough 528.)

**Gough, C. C., & Williams, T. P.**
Lever Bros., Ltd., Port Sunlight, Cheshire. (Rock Ferry 500.)

*v*

**Speakman, W., & Chaloner, S. E.**
Monsanto Chemicals, Ltd., Ruabon North Wales. (Ruabon 3, or Wrexham 2500 after 7 p.m.)

**O'Brien, P. D., & Hand, F. D.**
B. Laporte, Ltd., Luton, Beds. (Luton 891.)

*v*

**Champkin, R. H., & Mucklestone, C. J.**
B. Laporte, Ltd., Luton, Beds. (Luton 891.)
or
**Blow, D. G., & Cripps, V. G.**
British Drug Houses, Ltd., City Road, London, N.1. (Clerkenwell 3000.)

**Woodcock, C. T., & Hardern, V.**
British Tar Products, Ltd., Hayes Road, Cadishead, Manchester. (Irlam 87.)

*v*

**Bennitt, J. H., & Hayward, J. E. H.**
Bakelite, Ltd., Redfern Road, Tyseley, Birmingham. (Acocks Green 1181.)

**Willshere, A. E. C., & Grape, L. F.**
Borax Consolidated, Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)

*v*

**White, A. W., & Hornsby, R. H.**
Howards & Sons, Ltd., Uphall Works, Ilford. (Ilford 1113.)

**O'Connor, F., & Lacy, E. D.**
Murex Welding Processes, Ltd. Ferry Lane Works, Forest Road E.17. (Larkswood 2284.)

*v*

**Prosser, V. J., & Baxter, A.**
John Haig & Co., Ltd., 2, Pall Mall East, S.W.1, and United Yeast Co., Ltd., 238, City Road, E.C.1 (Whitehall 1040; Clerkenwell 0303.)

**Bovaird, D., & Lucas, P. L.**
British Drug Houses, Ltd., Graham Street, City Road, London, N.1. (Clerkenwell 3000.)
or
**Steel, H. A., & Jaffe, D. H.**
Society of Chemical Industry, Central House, 46/47, Finsbury Square, E.C.2, and Lever Bros., Ltd., Unilever House, London. (Met. 3773.)

**Brewer, G. J., & Goudie, A. W. A.**
British Celanese, Ltd., 23, Hanover Square, W.1, and Tar Residuals, Ltd., 4, Lloyds Avenue, E.C.3. (Mayfair 8000, Ext. 218.)

*v*

**Crosse, F. G., & Walker, J. E.**
Society of Chemical Industry, 46/7, Finsbury Square, E.C.2, and National Farmers' Union, 45, Bedford Square, W.C.1. (Met. 3773 and Mus. 7525.)

**Hayman, R. D., & Copp, C. G.**
Doulton & Co., Ltd., Lambeth, S.E.1. (Reliance 1241.)

*v*

# Personal Notes

MME. IRENE JOLIOT-CURIE has been appointed Under Secretary of State for Scientific Research in the new French Socialist Government.

MR. J. A. QUIGLEY (United Drug Co., Ltd.) and MR. G. W. SMITH (Boots Pure Drug Co., Ltd.) have been appointed to the Traffic Section Committee of the Nottingham Chamber of Commerce.

MISS BETTY SMITH, daughter of Sir Frank Smith, secretary of the Department of Scientific and Industrial Research, is to marry Mr. J. H. Fry on June 23. The wedding will take place in the ancient chapel of the Savoy, London.

DR. EDGAR DOUGLAS ADRIAN, F.R.S., of Cambridge, Foulerton Professor of the Royal Society, is to have conferred upon him the degree of D.Sc. at the encænia at Oxford University on June 24.

SIR JOSEPH ERNEST PETAVEL, F.R.S., of Bushy House, Teddington, Middlesex, director of the National Physical Laboratory since 1919, who died on March 31 last, aged 62 years, left estate of the gross value of £61,161, with net personalty £43,023. His effects, not otherwise disposed of, he left to the Royal Society, desiring them to allow the Director of the National Physical Laboratory to have the use and enjoyment of them so long as his residence shall be at Bushy House. After other bequests, the residue of the property he left to the Royal Society absolutely. Stating: "Whereas the National Physical Laboratory is called upon to take an important place in the national and international realm of science and also it is undesirable that the possession of private means should be a consideration in the choice of a director thereof, and it is equally undesirable that the sphere of influence and usefulness of the institution should be restricted by lack of means for various purposes which cannot appropriately be charged to public funds," he desired the Royal Society to apply the annual income from his estate as to two-fifths to the director of the National Physical Laboratory for entertainment expenses, one-fifth for the upkeep of his residence, one-fifth for the maintenance of the gardens of the laboratory and of his residence, and one-fifth for other expenses in connection with the directorship of the National Physical Laboratory. This bequest is conditional upon the present income of the director being in no way lessened.

MR. JAMES GREAVES, of Victoria Dyeing Co., Ltd., died on June 5, at St. Annes, at the age of 72.

MR. W. R. WIGGINS has been reappointed research assistant in the Department of Oil Engineering and Refining at the University of Birmingham.

MR. T. E. LESCHER, O.B.E., managing director of Evans Sons Lescher and Webb, Ltd., has been re-elected chairman of Liverpool Chamber of Commerce.

MR. GEORGE STEPHEN BAKER, superintendent of the William Froude Laboratory at the National Physical Laboratory, is to have the honorary degree of D.Sc. of Durham University conferred upon him at the Convocation on June 30.

DR. M. L. OLIPHANT has been appointed to the Poynting Chair of Physics, at the University of Birmingham, which will become vacant in September owing to the retirement of Professor S. W. Johnson Smith, F.R.S. Dr. Oliphant, who has published a large number of papers on his original research in physics, is at present assistant director of research in physics, Cavendish Laboratory.

SIR JOHN CUNNINGHAM MCLENNAN, F.R.S., of 88 Prince Arthur Avenue, Toronto, and of Ramsay Lodge, Virginia Water, Surrey, Emeritus Professor of Physics at the University of Toronto, left estate in England of the gross value of £9,732 (net personalty £4,545). He left his scientific books and instruments to the University of Toronto, for use in the McLennan Laboratory, and $5,000 to the University for scientific research work in the McLennan Laboratory, together with the painting of himself by Augustus John.

MR. LEOPOLD ALBU, who, while in Johannesburg, temporarily assumed the chairmanship of the General Mining and Finance Corporation, rendered vacant by the death of his brother, Sir George Albu, Bt., has, since his return to London, resigned. Sir George W. Albu, Bt., has been elected chairman in his place by his co-directors, and has also been appointed managing director in Johannesburg. Sir George was acting chairman and manager in Johannesburg of the corporation. It is also announced that MR. ERROLL HAY in consequence of his pending retirement at the end of June next as manager and technical adviser, will relinquish his seat on the board as from that date.

# Continental Chemical Notes

## Roumania

WITH A CAPITAL OF 2 MILLION LEI the "Electro-Chemica" Company has been founded at Bucharest by a group of Roumanian engineers.

## Belgium

RECENT COMPANY FORMATIONS include: Société pour la Fabrication d'Insecticides et d'Anticryptogamiques, Brussels, with a capital of 400,000 francs; Laboratoires Odopsine, Scharbeck (manufacture of pharmaceutical products).

## Germany

THE TRADING REPORT OF RUTGERSWERKE A.-G., of Berlin, discloses a net profit of 1.75 million marks (1.74 million in 1934) and the dividend is unchanged at 6 per cent. While the improvement in home trade was maintained, the export trade failed to maintain the previous year's level.

## Austria

THE CHEMOSAN-UNION A.-G. has taken over the Pharmazeutische Industrie A.-G. and Philipp Roder-Bruno Roabe A.-G., both in Vienna. Last year's trading resulted in a net profit of 55,000 schillings which has been carried forward to the new account.

## Spain

A SUPERPHOSPHATE FACTORY IS UNDER CONSTRUCTION at Zorroza, near Bilbao, by the firm of Llanoy Escudero, and is expected to be ready for production in a few weeks.

## Russia

EXTENSIVE CORUNDUM DEPOSITS are understood to have been located in the Jakut Republic and their exploitation is to be taken in hand without delay with a view to supplying material to the Iljitsch Abrasive Works at Leningrad.

A TITANIUM WHITE DEPARTMENT, with an eventual annual production capacity of 12,000 tons, will be included in the paint and pigment works now under construction at Czeljabinsk.

## Sweden

BETTER TRADING CONDITIONS WERE EXPERIENCED in 1935 by the cellulose manufacturing concern of Uddehohms A.B., turnover increasing to 4.5 million kronen (4 million previously). Net profit increased in 1935 to 4.12 million kronen (3.62 million previous year) from which a dividend of 4½ per cent. (against 4 per cent. previously) is distributed In addition to sulphite cellulose and paper, the concern manufacture ferrochrome, chlorine and paper-bleachers' chemicals.

# From Week to Week

THE INTERNATIONAL NICKEL CO. OF CANADA announces that it is enlarging its Port Colbourne electrolytic nickel refinery to increase the production capacity by 50 per cent.

THE DEPARTMENT OF OVERSEAS TRADE announce that the London Press Exchange, Ltd., have been appointed as advertising agents for the British Industries Fair of 1937, to be held in London and Birmingham, February 15 to 26, 1937.

NEARLY 300 DELEGATES FROM OVERSEAS attended the International Road Tar and Benzol Producers' Conference at Gleneagles, Perthshire, on June 9-13. Important questions concerning the production of motor spirit from coal were discussed.

MRS. MAGGIE ROBERTS, wife of Thomas Henry Roberts, of Monsanto Chemical Works, was killed by the fall of a boulder, when walking at Berwyn, Llangollen on June 8. With her two children she had climbed the Velvet Mountain, opposite Valle Crucis Abbey, and was descending when a boulder became dislodged and came hurtling down.

REPRESENTATIVES OF BENZOL PRODUCERS from more than eight countries have been attending the ninth plenary meeting of the International Conference of Benzol Producers at Gleneagles, Perthshire. The conference was held under the chairmanship of Sir David Milne-Watson, president of the National Benzol Association.

A SHED CONTAINING 1,000 TONS OF COPRA, worth about £20,000, caught fire at Port Sunlight on June 5. When, after several hours' work, the fire brigade thought the outbreak was under control, there was another burst of smoke from the shed and a wind caused the outbreak to spread. Parts of the metal sides of the shed were cut away with the aid of oxy-acetylene apparatus in an endeavour to restrict the fire. The smoke and fumes penetrated to Bromborough, two miles away.

NEGOTIATIONS HAVE NOW BEEN COMPLETED for India's biggest industrial combine, the cement merger. The combine, which will go by the name of the Associated Cement Companies of India, Ltd., will have a capital of 80,000,000 rupees (£6,000,000). All the cement companies in the country, excepting the Sone Valley Portland Cement Co., will be taken over by the merger. The combine is the outcome of the foresight of the late Mr. F. E. Dinshaw, a prominent Bombay financier and industrialist.

AN EXTRAORDINARY GENERAL MEETING of the British Cyanides Co., Ltd., was held at Ideal House, 1 Argyll Street, London, W.1, on June 5, when it was unanimously resolved by special resolution to change the name of the company to British Industrial Plastics, Ltd. The former name has ceased to give a true indication of the company's main interests now that the manufacture of cyanide has been discontinued and in view of its wide concern in plastics.

BOOTS PURE DRUG CO. have announced that with a view to stimulating Territorial recruitment they have decided to make a new concession to employees who are members of the Territorial Force. Hitherto, the firm has allowed these employees the fortnight off for camp, and has made up to them the difference between their army pay and what they would have earned at work. Under the new arrangement the firm will grant leave on full pay for the fortnight's training in addition to the ordinary holidays on full pay.

THE TWELFTH INTERNATIONAL CONGRESS OF OXY-ACETYLENE WELDING, which met in London this week, marks the centenary of the discovery of acetylene by Edmund Davy and the fiftieth anniversary of the industrial production of oxygen. The opening ceremony took place at the Guildhall. The business of the congress included the testing of welds by X-rays, the applications of oxy-acetylene welding and cutting in railway work, the technique of welding, and the training and selection of welders. Delegates visited the works of the British Oxygen Co. at Cricklewood and Edmonton on Tuesday, and on Friday, at the invitation of the British Oxygen Co., they were to attend the Aldershot Tattoo.

THE BRITISH FOUNDRY SCHOOL commences its second session in October, 1936, and a course of one year's instruction is provided. The total number of students taking the course for the first year, which opened in October, 1935, is thirteen and they are now in their final term. During the year they have had lectures from the lecturer-in-charge, Mr. J. Bamford, B.Sc., on foundry practice and foundry metallurgy, and on physics and chemistry from members of the permanent staff of the Birmingham Central Technical College. In addition, about 120 lectures have been given by specially selected specialists of national reputation in their particular subjects. Visits have been paid each week to foundries and laboratory and practical instruction is a feature of the course. The examination for the diploma will take place in July and a number of distinguished authorities and specialists have been appointed as assessors in connection with this examination. It is anticipated that the diploma will receive the endorsement of the Board of Education.

THE COKE OVENS AND BY-PRODUCT PLANT of the Powell Duffryn Associated Collieries, Ltd., at Dowlais, Glam., are to be reopened.

FINES TOTALLING £30 WERE IMPOSED on Pure Products, Ltd., soap manufacturers, of Colwick, at the Nottingham Shire Hall, for two offences under the Factories and Workshops Act. The first offence was for failing to keep the cover over an electric switch, and the second was that an accident resulting through the first offence was never reported.

THE TREASURY HAS ISSUED AN ORDER increasing the rate of drawback in respect of linseed oil used in the manufacture of certain classes of goods to 80s. per ton. In the case of punts, treated oils, etc., the increase came into force on June 10, and in the case of floor coverings, oil baize, fishing nets, etc., on December 1. The adjustment follows the increase in the duty on linseed oil.

THE BRITISH STANDARDS INSTITUTION is to convene a representative congress to take place on Wednesday, June 24, to consider the request received from the British Paper Box Manufacturers' Federation that consideration be given to the desirability of preparing a series of standard methods of testing vegetable glues on similar lines to those issued by the Institution in B.S.S. No. 547, British Standard Methods of Testing Bone, Hide and Fish Glues.

SOME DAY SCIENTISTS WILL BE ABLE TO PRODUCE FIBRES which will similate wool very closely, Dr. J. B. Speakman, of Leeds University, told the annual conference of the Textile Institute, in London, on June 5. He said that they had already succeeded in getting "crimp" and "scale" into artificial fibres, and he saw no reason why, in the future, artificial fibres should not have "crimp," "scale," and case of extension and complete recovery.

# Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

## Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ANGLO CONTINENTAL GUANO WORKS, LTD., London, E. (M., 13/6/36.) Registered June 2, £400,000 debenture stock (secured by Trust Deed dated May 27, 1936); general charge. *£242,500. October 29, 1935.

ILLINGWORTH CARBONIZATION CO., LTD., Manchester. (M., 13/6/36.) Registered May 26, £2,541 debentures, part of £50,000 (not ex.) already registered. *£36,700. January 3, 1936.

## County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

THORNFIELD, GODFREY (trading as Beaucaire Laboratories), 36 Rossmore Court, Park Road, N.W., manufacturing chemist. (C.C., 13/6/36.) £27 13s. 10d. May 7.

THORNFIELD, GODFREY (trading as Beaucaire Laboratories), 14 America Square, E.C., manufacturing chemist. (C.C., 13/6/36.) £14 8s. 8d. May 7.

BROWN, W. J. (BRISTOL), LTD., Regent House, Fitzroy Square, W., fertiliser manufacturers. (C.C., 13/6/36.) £35 17s. 11d. March 20.

# Weekly Prices of British Chemical Products

LONDON.—The London chemical market continues on quietly steady lines. Price changes are reported for acetate of lime, brown; acetate of lime grey; methyl acetone, 40/50 per cent.; wood creosote, unrefined; wood naphtha, miscible; wood naphtha, solvent; pyridine 90/140; toluol 90 per cent.; and toluol pure.

MANCHESTER.—With the exception of one or two Lancashire towns outside Manchester where the holidays extended over the beginning of the present week industrial operations in the district have about returned to normal and deliveries of chemicals into consumption locally have been fully resumed. Fair quantities are being taken up in the cotton bleaching and finishing industries, which are showing a welcome improvement, and in most other directions contracts are being steadily drawn against. So far as new business is concerned, however, actual bookings during the past week have not been of very great importance, although a number of contract renewals have been reported. Among the by-products a certain amount of easiness continues in evidence, but in the heavy chemicals steady to firm price conditions still obtain.

## General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND. £64 to £65 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £48 to £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—Flaked, 10d. per lb., less 2½%; ground, 10¼d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11¼d., less 5%. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 11¾d. to 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—5s. 1d. to 5s. 4d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£40 to £43 per ton.

LEAD ACETATE.—LONDON: White, £33 15s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £34, brown £33.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £26 to £28 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 5s. to £16 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38 10s.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¼d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d.. MANCHESTER: B.P., 11¼d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 7¾d. to 8d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d. to 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANLHESTER: £3 2s. 6d. to £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.— £29 per ton. SCOTLAND: 3⅞d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

## Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price up to June 30, 1936, is £7 5s. per ton for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CALCIUM CYANAMIDE.—The price up to June 30, 1936, is £7 5s. per ton delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935-36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station. All terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station. All terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton, delivered in 6-ton lots to farmer's nearest station.

## Coal Tar Products

ACID, CRESYLIC.—97/99%, 2s. 5d. to 2s. 7d. per gal.; 99/100%, 3s. to 3s. 6d. per gal., according to specification; pale 98%, 2s. 7d. to 2s. 9d.; dark, 1s. 10d. to 1s. 11d. LONDON: 98/100% 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's 2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6¾d. per lb.; crude, 2s. 2d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¾d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £17 10s. per ton; purified crystals, £25 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. to 7s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90 2s. to 2s. 1d. per gal.; pure, 2s. 5d. to 2s. 6d.

XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d.

PITCH.—Medium, soft, 37s. 6d. per ton, in bulk at makers works. MANCHESTER: 30s. to 32s. 6d. f.o.b., East Coast.

## Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £8 10s. per ton; grey, £10 5s. to £10 15s. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £10; grey, £11.

CHARCOAL.—£5 to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £45 to £48 per ton.

WOOD CREOSOTE.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.

WOOD, NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 9d. per gal.

WOOD TAR.—£2 to £2 10s. per ton.

## Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¼d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free

*o*-CRESOL 30/31° C.— 6d. per lb. in 1-ton lots.

*p*-CRESOL 34-5° C.—1s. 6d. per lb. in ton lots.

*m*-CRESOL 98/100%.—1s. 7d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.

α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

*o*-NITRANILINE.—3s. 11d. per lb.

*m*-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

*p*-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

*o*-TOLUIDINE.—9½d. to 11d. per lb.

*p*-TOLUIDINE.—1s. 11d. per lb.

## Latest Oil Prices

LONDON, June 10.—LINSEED OIL was steady. Spot, £27 per ton (small quantities); June to Jan.-April, £24 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), afloat, £21 15s. per ton. RAPE OIL was slow. Crude, extracted, £33 per ton; technical, refined, £34 10s., naked, ex wharf. COTTON OIL was firm. Egyptian, crude, £24 10s. per ton; refined common edible, £27 10s.; and deodorised, £29 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was easy. American, spot, 39s. per cwt.

HULL.—LINSEED OIL.—Spot, quoted £25 per ton; June, July-Aug., and Sept.-Dec., £24 10s. COTTON OIL.—Egyptian, crude, spot, £25 per ton; edible, refined, spot, £27; technical, spot, £27; deodorised, £29, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £20 per ton naked. GROUNDNUT OIL.—Extracted, spot, £30 10s. per ton; deodorised, £33 10s. RAPE OIL.—Extracted, spot, £32 per ton; refined, £33 10s. SOYA OIL.—Extracted, spot, £25 10s. per ton; deodorised, £28 10s. COD OIL.—F.o.r., or f.a.s., 25s. per cwt., in barrels. CASTOR OIL.—Pharmaceutical, 42s. 6d. per cwt.; first, 37s. 6d.; second, 35s. 6d. TURPENTINE.—American, spot, 41s. 6d. per cwt.

# Books Received

**Perfumes, Cosmetics and Soaps.** By W. A. Poucher. London: Chapman and Hall, Ltd. Pp. 426. 25s.

**Flavours and Essences.** By M. H. Gazan. London: Chapman and Hall, Ltd. Pp. 116. 25s.

**Central Narcotics Intelligence Bureau.** Annual Report for the Year 1935. Egyptian Government. Cairo: Government Press, Bulaq. Pp. 164. P.T.10.

**Some Chemical Methods of Weed Destruction.** By H. C. Long and R. K. MacDowall. Surbiton: H. C. Long. Pp. 24. 6d. post free.

# Chemical and Allied Stocks and Shares

SINCE the beginning of the new Stock Exchange account on Monday a better tendency has been in evidence in most sections of stock and share markets. The lower unemployment figures created a good impression and tended to emphasise that the improvement in internal trade conditions is probably being more than maintained. Moreover, the indications that after all the devaluation of the franc may not be proposed yet awhile also exercised a favourable influence. Although prices have not moved up strongly, most of the usually active shares of chemical and allied companies have come in for increased business this week as a result of the rather better general market conditions. Imperial Chemical were favoured on the belief that when there is any pronounced rise in leading industrial shares the company's ordinary shares may come in for considerable attention as they offer a rather larger yield than most first class industrial shares. Distillers have been very firm on continued hopes in the market of a larger dividend or a possible share bonus, while United Molasses more than maintained their recent improvement. It is assumed in the market that when world trade conditions are really better the company's profits may advance to a considerably higher level. Prior to the general trade depression its profits reached the £1,000,000 level. If this were regained in the future it would permit of very high dividend payments as the capital has since been reduced considerably by the reconstruction. Imperial Smelting were fairly steady. The tendency in the price of zinc, as in the prices of base metals generally, has been rather unfavourable recently, but as the company has apparently benefited from the better average price of zinc which has ruled during the past twelve months, there are continued hopes in the market that the shares will re-enter the dividend list this year. The company's accounts are made up to the end of this month. The 6½ per cent. preference shares, which are changing hands at around 25s. 4½d. at the time of writing, have never been out of the dividend list. B. Laporte continued to be held very firmly. The price of the shares has to be read in relation to the excellent earning capacity of the business. Last year's increased dividend of 22½ per cent. (against 20 per cent.) required £32,002, but owing to the larger profits, it was possible to allocate £22,223 to general reserve and to raise the carry forward from £19,988 to £21,775. British Glues continued fairly steady on the belief that the forthcoming results will confirm market expectations of a resumption of dividends. It is nevertheless recognised that in view of the constructive policy invariably followed by the directors, a good proportion of the profits will probably be placed back into the business. Triplex Safety Glass were again prominent on continued anticipations of a favourable increase in dividend for the financial year ending this month, or a possible bonus. Salt Union were better and increased demand for British Oxygen was again in evidence on the belief that indications suggest that the demand for industrial gases is likely to expand further this year, granted the continuance of activity in the heavy industries. Burt, Boulton and Haywood were more active. In view of the company's diversified activities it is realised in the market that the company's profits are dependent on many different factors, but bearing in mind the larger interim dividend paid earlier in the year, the disposition is to assume that the total dividend will be increased, granted that the company's business on the Continent shows satisfactory results. British Cyanides have been rather dull and British Drug Houses and Lawes Chemical were unchanged, but the prices of the two last-named shares were not apparently tested by much business. Blythe Colour Works 4s. shares received more attention around 12s. 9d. The official particulars, published earlier in the year when dealing in the shares started, showed that on the basis of last year's profits earnings on the ordinary shares would work out at over 32 per cent. Current market anticipations are that there are possibilities of a dividend of 20 per cent., and that there may, perhaps, be an interim dividend before long. Fison, Packard and Prentice were steady and are unchanged on balance at the time of writing. Borax Consolidated deferred were again active on favourable views of the company's prospects, and the preferred ordinary and preference shares showed rather more "markings" of business. It is hoped in the market that in September there may be an interim dividend on the deferred shares. Unilever were again active, partly on further buying from the Continent. In view of the world-wide nature of the business of the Unilever group it is realised that is very difficult to form any definite view as to outlook for the current year, but the tendency is to take the view that long-term prospects are very good and that eventually a favourable increase in profits and dividend can be anticipated. At one time before the general trade depression earnings on Unilever ordinary shares were over 17½ per cent. and dividends of 10 per cent. were paid. Boots Pure Drug were firm, having remained under the influence of the excellent impression created by the report and accounts, which had the effect of emphasising the high earning capacity of the business and the strength of the balance sheet position. The latter suggests that whenever the directors consider the time opportune some form of share bonus is possible. In other directions Staveley Coal and Iron found buyers on any reaction in the price, hopes of a larger dividend having persisted. Dorman Long ordinary were good and Consett Iron showed active business at higher prices. Lewis Berger were more active, aided by the view current in the market that, despite the fact that there was no increase in the interim dividend, a further increase in the total dividend seems likely. Last year the dividend was 15 per cent., and this was a conservative payment. Oil shares were less active and Anglo-Iranian were lower, awaiting the statements at the meeting as to the outlook. Rather lower prices were also made by most of the other leading oil shares. Dealings in the recently issued shares of Greeff-Chemicals Holdings are expected to commence shortly.

| Name. | June 9. | June 3. |
|---|---|---|
| Anglo-Iranian Oil Co., Ltd. Ord. | 85/7½ | 86/3 |
| Associated Dyers and Cleaners, Ltd. Ord. | 1/9 | 1/3 |
| Associated Portland Cement Manufacturers, Ltd. Ord. | 87/6 | 85/6 |
| ,, 5½% Cum. Pref. | 28/9 | 28/9 |
| Benzol & By-Products, Ltd. 6% Cum. Part Pref. | 5/- | 6/3 |
| Berger (Lewis) & Sons, Ltd. Ord | 68/9 | 68/9 |
| Bleachers' Association, Ltd. Ord. | 5/- | 5/- |
| Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.) | 20/- | 20/- |
| Boots Pure Drug Co., Ltd. Ord. (5/-) | 53/6 | 53/6 |
| Borax Consolidated, Ltd., Pfd. Ord. (£) | 110/- | 110/- |
| ,, Defd. Ord. | 28/1½ | 28/1½ |
| ,, 5½% Cum. Pref. (£10) | £11/17/6 | £11/17/6 |
| Bradford Dyers' Association, Ltd. Ord | 7/6 | 7/7½ |
| British Celanese, Ltd. 7% 1st Cum. Pfd. | 23/3 | 23/- |
| British Cotton & Wool Dyers' Association Ltd. Ord. (5/-) | 5/9 | 5/9 |
| British Cyanides Co., Ltd., Ord. (2/-) | 3/6 | 3/6 |
| British Drug Houses, Ltd. Ord. | 20/- | 20/- |
| ,, 5% Cum. Pref. | 22/6 | 22/6 |
| British Glues and Chemicals, Ltd. Ord. (4/-) | 8/6 | 9/3 |
| ,, 8% Pref. (Cum. and Part.) | 30/- | 30/- |
| British Oil and Cake Mills, Ltd. Cum. Pfd. Ord. | 48/9 | 48/9 |
| British Oxygen Co., Ltd., Ord. | 95/- | 96/3 |
| ,, 6½% Cum. Pref. | 34/4½ | 34/4½ |
| British Portland Cement Manufacturers, Ltd. Ord. | 93/9 | 92/6 |
| Bryant & May, Ltd. Pref. | 67/6 | 67/6 |
| Burt, Boulton & Haywood, Ltd. Ord. | 21/3 | 21/3 |
| ,, 7% Cum. Pref. | 28/9 | 28/9 |
| ,, 6% 1st Mort. Deb Red. (£100) | £101/10/- | £102/10/- |

| Name. | June 9. | June 3. |
|---|---|---|
| Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5) | 108/9 | 108/9 |
| ,, 4% 1st Mort. Deb. Red. (£100) | £94/10/- | £94/10/- |
| Calico Printers' Association, Ltd. Ord. | 6/10½ | 7/1½ |
| Cellulose Acetate Silk Co., Ltd. Ord. | 11/3 | 12/10 |
| Consett Iron Co., Ltd. Ord. | 10/- | 8/9 |
| Cooper, McDougall & Robertson, Ltd. Ord. | 30/- | 33/9 |
| ,, 7% Cum. Pref. | 28/9 | 28/9 |
| Courtaulds, Ltd. Ord. | 50/- | 51/10½ |
| Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref. | 25/- | 25/- |
| Distillers Co., Ltd. Ord. | 102/- | 102/- |
| ,, 6% Pref. Stock Cum. | 31/6 | 31/6 |
| Dorman Long & Co., Ltd. Ord. | 32/6 | 31/- |
| English Velvet & Cord Dyers' Association Ltd. Ord. | 3/9 | 3/9 |
| Fison, Packard & Prentice, Ltd. Ord. | 44/4½ | 44/4½ |
| ,, 7% Non-Cum. Pref. | 31/3 | 31/3 |
| ,, 4½% Debs. (Reg.) Red. (£100) | £106 | £106 |
| Gas Light and Coke Co. | 28/3 | 28/3 |
| ,, 4% Consolidated Pref. Stock (£100) | £106/10/- | £106/10/- |
| Goodlass Wall & Lead Industries, Ltd. Ord. (10/-) | 12/6 | 12/6 |
| ,, 7% Prefd. Ord. (10/-) | 13/1½ | 13/1½ |
| ,, 7% Cum. Pref. | 28/9 | 28/9 |
| Gossage, William, & Sons, Ltd. 6½% Cum. Pref. | 24/4½ | 24/4½ |
| Imperial Chemical Industries, Ltd. Ord. | 39/- | 39/4½ |
| ,, Deferred (10/-) | 9/7½ | 9/7½ |
| ,, 7% Cum. Pref. | 34/7½ | 34/7½ |
| Imperial Smelting Corporation, Ltd. Ord. | 16/3 | 16/3 |
| International Nickel Co. of Canada, Ltd. | $46½ | $47¼ |
| Johnson, Matthey & Co., Ltd. 5% Cum Pref. (£5) | 105/- | 105/- |
| Laporte, B., Ltd. Ord. | 115/- | 115/- |

| Name. | June 9. | June 3. |
|---|---|---|
| Lawes Chemical Co., Ltd. Ord. (10/-) ..... | 8/9 | 8/9 |
| ,, 7% Non-Cum. Part Pref. (10/-) | 10/- | 10/- |
| Lever Bros., Ltd. 7% Cum. Pref. ..... | 33/6 | 34/- |
| Magadi Soda Co., Ltd. 6% 2nd Pref. (5/-) | 6d. | 6d. |
| ,, 6% 1st Debs. (Reg.) ..... | £35 | £35 |
| Major & Co., Ltd. Ord. (5/-) ..... | 7½d. | 7½d. |
| ,, 8% Part. Prefd. Ord. (10/-) ... | 9d. | 9d. |
| ,, 7½% Cum. Pref. ..... | 1/6¾ | 1/6¾ |
| Pinchin, Johnson & Co., Ltd. Ord. (10/-) | 47/- | 46/6 |
| Potash Syndicate of Germany 7% Gld. Ln. Sr. "A" and "B" Rd. ..... | £79 | £78 |
| Reckitt & Sons, Ltd. Ord. ..... | 115/- | 115/- |

| Name. | June 9. | June 3. |
|---|---|---|
| Salt Union, Ltd. Ord. ..... | 42/6 | 42/6 |
| ,, Pref. ..... | 47/6 | 47/6 |
| South Metropolitan Gas Co. Ord. (£100) | £124/10/- | £125/10/- |
| Staveley Coal and Iron Co., Ltd. Ord. ... | 51/3 | 51/10½ |
| Stevenson & Howell, Ltd. 6½% Cum. Pref. | 26/3 | 26/3 |
| Triplex Safety Glass Co., Ltd. Ord. (10/-) | 91/3 | 91/3 |
| Unilever, Ltd. Ord. ..... | 33/1½ | 32/6 |
| United Glass Bottle Manufacturers, Ltd. Ord. ..... | 44/6 | 44/6 |
| United Molasses Co., Ltd. Ord (6/8) ... | 23/1½ | 23/1½ |
| United Premier Oil & Cake Co., Ltd. Ord. (5/-) ..... | 10/- | 10/- |

# Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

## Specifications Open to Public Inspection

ORES AND METALLURGICAL PRODUCTS containing iron and nickel, process for working.—F. Krupp Grusonwerk A.G. Nov. 28, 1934. 25260/35.

GASEFYING FINE COAL OR DUST COAL with circulating gas chiefly for the production of water gas or gas for the synthesis of benzine, method and apparatus. Wintershall, A.-G. and H. Schmalfeldt. Nov. 26, 1934. 30360-1/35.

CONTINUOUS NITRATION OF AROMATIC HYDROCARBONS, process and apparatus.—J. Meissner. Nov. 28, 1934. 30715/35.

METALLIC MAGNESIUM, production.—Oesterreichisch Amerikanische Magnesit, A.-G. Dec. 1, 1934. 31950/35.

ARTIFICIAL RESINS, manufacture.—Herbig-Haarhaus, A.-G. Nov. 30, 1934. 32794/35.

DYEINGS AND PRINTINGS, process for producing.—I. G. Farbenindustrie. Nov. 29, 1934. 33172/35.

FLUORINE COMPOUNDS OF ALIPHATIC HYDROCARBONS, manufacture.—I. G. Farbenindustrie. Nov. 29, 1934. 33173/35.

HYDRATED MAGNESIUM SILICATE DECOLORIZING MATERIALS, production.—L. Caldwell. Dec. 1, 1934. 33323/35.

SULPHURIC ACID, manufacture.—Imperial Chemical Industries, Ltd. Nov. 30, 1934. 33408/35.

## Specifications Accepted with Date of Application

TITANIUM COMPOUNDS, preparation.—S. F. W. Crundall, and P. Spence and Sons, Ltd. Aug. 21, 1934. 447,744.

VOLATILE METALS, furnaces for obtaining.—N. Lebedenko, and J. Elian. Aug. 21, 1933. 447,745.

POLYMERIZATION PRODUCTS OF OLEFINES, process for the manufacture.—A. Carpmael (I. G. Farbenindustrie). Aug. 23, 1934. 447,973.

DETERGENT, WETTING, EMULSIFYING, PENETRATING, and like agents, manufacture.—L. H. Flett. Sept. 26, 1933. 447,898.

DYEING LEATHER, process.—J. R. Geigy, A.-G. Nov. 18, 1933. 448,016.

DYESTUFF-SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Sept. 21, 1934. 447,899.

PLASTERS and the like, production.—S. K. Smith, J. Watson, and Imperial Chemical Industries, Ltd. Oct. 23, 1934. 447,753.

ELECTRODES FOR ELECTROLYTIC PROCESSES, manufacture.—B. Laporte, Ltd., and I. E. Weber. Oct. 26, 1934. 447,827.

DYEING LEATHER, process.—J. R. Geigy, A.-G. Nov. 18, 1933. 447,905.

ACID ANHYDRIDES, production.—Deutsche Gold-Und Silber-Scheidealstalt Vorm Roessler. Nov. 17, 1933. 447,756.

DYEING LEATHER, process.—J. R. Geigy A.-G. Nov. 18, 1933. 447,906.

CELLULOSE DERIVATIVE COMPOSITIONS.—E. I. du Pont de Nemours and Co., and M. M. Brubaker. Nov. 21, 1934. 447,764.

ARSENOBENZENE-MONOSULPHOXYLATES, manufacture.—I. G. Farbenindustrie. Dec. 19, 1933. 447,773.

AZO DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Nov. 25, 1933. 447,775.

AZO DYESTUFFS, manufacture and production.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Nov. 26, 1934. 447,911.

MANGANOUS PHOSPHATE DIHYDRATE, manufacture.—I. G. Farbenindustrie. Nov. 28, 1933. 447,918.

WATER PURIFICATION.—W. Paterson. Nov. 28, 1934. 447,980.

FIBRE OF INSOLUBLE AZO DYESTUFFS, production.—E. I. du Pont de Nemours and Co., M. A. Dahlen, and R. E. Etzel-Miller. Nov. 28, 1934. 447,985.

VALUABLE VISCOUS LIQUIDS, production.—A. W. Nash, T. G. Hunter, and W. R. Wiggins. Dec. 1, 1934. 447,778.

CONVERSION OF SOLID CARBONACEOUS MATERIALS into liquid hydrocarbons by hydrogenation under pressure and in the presence of catalysts.—Compagnie des Mines de Vicoigne, Noeux and Drocourt. Oct. 10, 1934. 447,930.

SUBSTITUTED BENZYL CARBINAMINES, method for the production.—L. Mellersh-Jackson (F. P. Nabenhauer). March 11, 1935. 447,792.

RECLAIMING USED LUBRICATING OILS, process.—F. G. Baender. May 16, 1935. 448,009.

MULTI-CELLULAR GLASS, process of manufacture.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny, and Cirey. May 28, 1934. 447,805.

COLD-SWELLING STARCH, process of making.—E. Stern. June 17, 1935. 447,810.

AZO DEYSTUFFS, process for the manufacture.—I. G. Farbenindustrie, A.-G. Nov. 25, 1933. 447,814.

PREPARATION OF PITCH.—H. D. Elkington (Ges. für Teerverwertung). July 23, 1935. 447,861.

HIGHLY CONCENTRATED NITRIC ACID, manufacture.—Hydro Nitro Soc. Anon., and T. Hobler. Aug. 13, 1934. 447,952.

HALOGENATED ORGANIC ACIDS, production.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 19, 1934. 447,876.

MULTI-CELLULAR GLASS, process of manufacture.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny, and Cirey. May 28, 1935. 447,821.

BODIES CONTAINING METALLIC CARBIDE, manufacture.—G. Fodor, and E. Allen and Co., Ltd. Nov. 16, 1935. 447,822.

EXPLOSIVES, manufacture.—Liquid Oxygen Explosives, Ltd., and A. E. Lance. Dec. 10, 1935. 447,887.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 7, 1934. 447,890.

## Applications for Patents

MONOAZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., A. H. Knight. 14103.

WOOL-DYEING PROCESS.—Imperial Chemical Industries, Ltd., C. H. Giles. 14170.

LACTIC SUGAR, production.—J. A. Jessop. 14269.

AMMONIUM BICARBONATE, production.—G. W. Johnson (I. G. Farbenindustrie.) 13668.

DISAZO DYESTUFFS, production.—G. W. Johnson (I. G. Farbenindustrie). 14037.

SEPARATION OF SULPHURETTED HYDROGEN FROM GASES.—H. Kemmer and M. Raschig. 13863.

THIONES AND SELENONES, manufacture.—J. D. Kendall. 14326.

HYDROCARBONS, treatment.—B. Malishev. 13672.

SULPHUR DIOXIDE, production.—Metallges, A.G. (Germany, July 5, '35.) 14121.

GERMICIDE, manufacture.—O. A. G. Newell. 14164.

REFRACTORY PRODUCTS.—Non-Metallic Minerals, Inc. (United States, Sept. 16, '35.) 14211.

POLYMERISATION OF OLEFINES.—Standard Oil Development Co. (United States, Oct. 26, '35.) 13861.

CONDENSATION PRODUCTS, manufacture.—W. J. Tennant (Henkel and Cie, Ges.). 13924.

SEPARATORS FOR SOLIDS AND LIQUIDS.—T. Tidbury. 14239, 14240.

THIO-BARBITURIC ACID COMPOUND, process of obtaining.—A. F. Burgess (Parke, Davis and Co.). 15224.

SULPHUR TRIOXIDE, production.—W. Büsching. (France, June 19, '35.) 15117.

BARBITURIC ACIDS COMPOUNDS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 15257.

MIXTURES OF DYESTUFFS AND DYEING, ETC. therewith, manufacture.—A. Carpmael (I. G. Farbenindustrie). 15523.

CHROMIUM STEELS.—Electro Metallurgical Co. (United States, June 8, '35.) 15170.

ALLOY STEELS.—Electro Metallurgical Co. (United States, June 6, '35.) 15171.

PECTIN COMPOSITION, production.—G. R. Gould and C. G. Spalding. 15305.

DIAZONIUM SALTS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 15084.

POLYCARBOXYLIC ACID CHLORIDES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 15386.

SUBSTITUTED BENZENE CARBOXYLIC ACID CHLORIDES.—W. W. Groves (I. G. Farbenindustrie). 15888.

TRIMETHYLAMINE, production.—I. G. Farbenindustrie. 14970.

HIGHLY DISPENSED PIGMENTS, manufacture.—I. G. Farbenindustrie. (Germany, June 1, '35.) 15005.

POLYMERIZATION PRODUCTS OF OLEFINES, manufacture.—I. G. Farbenindustrie. (Holland, June 3, '35.) 15461.

MEANS FOR DYEING FURS, ETC.—M. Mendoga (Imperial Chemical Industries, Ltd.). 15021.

CATALYTIC GAS REACTIONS, apparatus.—E. I. du Pont de Nemours and Co. 15252

CHLORINE DIOXIDE, production.—J. M. Jackson, L. Mellersh (Mathieson Alkali Works). 15118.

TRIMETHYLAMINE, production.—G. W. Johnson. 14970.

COMPOUNDS OF PHTHALOCYANINE SERIES, production.—G. W. Johnson (I. G. Farbenindustrie). 15221.

PY-C-ALKYL-1(N).S-PYRAMOLOANTHRAQUINONES, production.—G. W. Johnson (I. G. Farbenindustrie). 15222.

LEUCO ESTERS OF DYESTUFFS OF ANTHRAQUINONE-AZOLE SERIES, production.—G. W. Johnson (I. G. Farbenindustrie). 15378.

ALUMINIUM OXIDE, preparation.—H. Löfquist. 15458.

PLANTS FOR HYDROGENATION of hydrocarbonous substances containing sulphur. P. Marecaux. (France, May 31, '35.) 15198.

## Company News

**Cellon, Ltd.**—An interim dividend has been declared for the half year ending June 30 on the 6 per cent. preference shares.

**Midland Tar Distillers.**—Payment of a dividend of 3 per cent., tax free, is announced for the half year to June 30, 1936, on the 6 per cent. tax-free preference shares.

**Standard Chemical Co.**—Gross profits for the year to March 31, 1936, amounted to $58,463 (against $19,806); after providing $17,500 for depreciation and $5,000 reserve for Canadian income tax the net profit was $35,963.

**"Sanitas" Trust, Ltd.**—Payment will be made on July 1 of a tax-free dividend of 1d. per 1s. ordinary share in respect of the year ended May 31, 1936. A similar payment was made in respect of the previous year.

**United Glansztoff Works.**—This German rayon producer reports a gross profit of Rm.13,950,000 for 1935, compared with Rm.18,280,000 in the previous year. There is again no dividend on the Rm.75,000,000 share capital.

**Compania Salitrera Anglo-Chilena.**—An interim of 2¼ per cent. (actual) is announced, payable on July 1, on the 4½ per cent. (income) debenture stock. The first interest on the newly established rate of 4½ per cent. was paid on January 1 last in respect of the year ended June 30, 1935.

**John Dale Metal Containers.**—The profit for 1935, after providing for directors' fees and taxation, was £11,719, and £5,875 was brought in. The directors recommend a final dividend of 3 per cent., making 5½ per cent. (first ordinary dividend), leaving £8,355 to be carried forward.

**Cape Asbestos Co., Ltd.**—Net profits in 1935 increased by £5,958 to £31,461. The ordinary dividend is raised from 6 per cent. to 8 per cent., and the preference shares receive a final of 8 per cent., making 13 per cent., compared with 11 per cent. After allocating a further £2,000 to staff fund, and crediting £12,732 brought in, there remains £15,942 to be carried forward.

**British Oxygen Co.**—An interim dividend of 3¼ per cent. on the 6½ per cent. cumulative preference stock is announced for the half year ending June 30, 1936, payable to holders registered in books at close of business on June 12. Income tax will be deducted at the rate of 4s. 4½d. in £ (standard rate 4s. 9d., less 4½d. in respect of Dominion income tax relief).

**Cannon Iron Foundries, Ltd.**—An interim of 5 per cent., less tax, is announced on the ordinary shares, on account of the year ending September 30, 1936. This is the first interim to be paid, the company having been formed in March, 1935. The usual half-yearly dividend on the 5½ per cent. redeemable cumulative preference shares is also announced, and both dividends will be paid on July 1.

**Anglo-Iranian Oil Co.**—The trading profit, after depreciation, was £5,979,209 for the year 1935 against £5,977,327 in the previous twelve months, and interest and fees totalled £150,436, against £131,950. The ordinary dividend is raised from 12½ per cent. to 15 per cent., and after providing £408,747, against £459,107, for extra depreciation and providing for preference dividends, the carry-forward is raised from £485,674 to £511,126.

**Forster's Glass Co., Ltd.**—A net trading profit for the year to March 31, 1936, of £41,842 is reported, an increase of about £600 on that of the previous year. The transfer to reserve is increased from £17,000 to £18,000. A dividend of 5 per cent. and a cash bonus of 5 per cent. to ordinary shareholders is again recommended, and a surplus of £11,492 is carried forward, against £11,025 brought in.

**International Bitumen Emulsions.**—Payment of a final dividend of 5 per cent. is announced for the year ended March 31, 1936.

**Esperanza Copper and Sulphur.**—The profit declined from £246 to £206 for 1935. The balance brought forward of £3,601 gives a total balance to be carried forward of £3,807.

**I. G. Farbenindustrie, of Frankfurt.**—A dividend of 7 per cent. has been declared, the same as for each of the previous four years. Net profits have increased only slightly—from Rm.50,981,100 to Rm.51,439,800. Deductions were reduced from Rm.83,741,300 to Rm.64,243,100.

**Boots Pure Drug Co.**—For the year to March 31 last the net profits are up from £750,037 to £770,889, and for the eighth successive year the dividend totals 24 per cent., less tax, plus a 5 per cent. tax free bonus. The allocation to general reserve is £100,000, against £150,000, bringing this fund up to £1,900,000. A transfer of £17,948 is made to freehold property reserve and £54,193 to contingencies reserve, leaving the carry-forward increased from £260,091 to £298,090.

## New Companies Registered

**Baynards, Ltd.**—Registered June 4. Nominal capital £100. Consulting, analytical, manufacturing, pharmaceutical and general chemists, herbalists, drug merchants and dealers, etc. Directors: Leonard B. Beynard, 40 Colbourne Road, Hove, Cyril G. Long.

**Chemical and Carbon Products, Ltd.**, 91 Moorgate, London, E.C.2.—Registered June 3. Nominal capital £1,000. Refiners, importers and exporters of and dealers in carbon, carbon products, manganese, graphite, zinc, wax and minerals and raw materials for use in the manufacture of wireless sets and accessories, etc. Directors: Josef Guttmann, Arthur V. Perry.

**Drogheda Chemicals, Ltd.**—Registered June 5. Nominal capital £1,000. Manufacturers of and dealers in chemicals of all kinds, dealers in limestone, lime, gypsum, coal, anthracite, coke, peat and the like materials, etc. Directors: Henry C. Nealon, 4 Ashdale Road, Terenure, Dublin, Hugh S. Watson, Robert H. D. Barklie and Thomas S. Morewood.

**Eastern Dry Ice Syndicate, Ltd.**—Registered June 8. Nominal capital £1,200. To acquire any invention relating to an improved method of manufacture of dry ice, to adopt an agreement with Geo. D. G. Cribb, and to carry on the business of liquid and solid carbon dioxide or dry ice manufacturers, etc. A subscriber: F. Stanley Wedlake, 17 Bedford Row, London, W.C.1. Directors: Albert H. Redfern, Geo. D. G. Cribb, Harry P. Gibbs and Stanley Mullard.

**Executors of Wm. Sharratt, Ltd.**, Tower Works, Clayton, Manchester.—Registered June 3. Nominal capital £2,000. To acquire the business of manufacturing chemists carried on at Tower Works, Clayton, Manchester, by H. Sharratt and W. Sharratt. Directors: Harold Sharratt, Walter Sharratt.

**Greeff-Chemicals Holdings, Ltd.**—Registered June 6. Nominal capital £250,000. To adopt two agreements with R. W. Greeff and Co., Ltd., and an agreement between Nathan and Rosselli of the first part, the company of the second part and John S. Lake and others of the third part, to acquire the issued share capital of R. W. Greeff and Co., Ltd., and to carry on the business of manufacturers of, agents for and dealers in chemicals, chemical products and by-products, abrasive papers, medicines, etc. A subscriber: Ormond J. Hook, "Dorana," Grange Crescent, Chigwell, Essex.

**Henry Dale and Co., Ltd.**, 12 Holborn Viaduct, London, E.C.1.—Registered June 6. Nominal capital £1,000. Agricultural merchants, manufacturers of and dealers in animal feeding stuffs, oil, tallow, soap and pitch importers, dealers in chemicals, etc. Directors: Percy H. Moos, Stanley J. Moos.

**International Chemical Research Association, Ltd.**, 69 Fleet Street, London, E.C.—Registered June 5. Nominal capital £1,000. To acquire the business of a manufacturer of patent medicines carried on by Ernest E. Spiers at 69 Fleet Street, E.C., as the "International Chemical Association." Directors: Ernest E. Spiers, Bernard S. Spiers, Sydney P. Spiers.

**Sheffield Chemical Co., Ltd.**, Don Vitriol Works, Washford Road, Attercliffe, Sheffield.—Registered June 4. Nominal capital £35,000. Chemical manufacturers carried on by the Sheffield Chemical Co., Ltd. (incorporated on May 26, 1898) at Sheffield and Rotherham, Yorkshire. Directors: Henry Ellison, Henry S. Ellison.

## Chemical Trade Inquiries

**The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).**

**Mexico.**—A firm in Mexico City desire to obtain the agency of United Kingdom manufacturers of dyes, soaps, oils, textile finishes generally and particularly indigo "sole" in grains and powders and in sulphur colours (powder). (Ref. No. 494.)